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HYDROCARBON EMISSION SOURCES IN PIONEER VALLEY

VOLUME II

GCA CORPORATION

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1975

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This report is a study of the hydrocarbon emission sources in three counties in Massachusetts - Franklin, Hampshire, and Hampton. The main objective was to identify the types of hydrocarbon emission sources found in this study area. The results were a prerequisite for evaluating possible stationary source regulations and were necessary for the development of transportation control strategies for achieving and maintaining the carbon monoxide and photochemical oxidant air quality standards.

Best estimates of hydrocarbon emissions are also provided for 1975, 1977, 1980, and 1985 with and without controls. Types of hydrocarbon control equipment and associated costs are presented throughout the report.

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SECTION I

INTRODUCTION AND SUMMARY

This report, prepared by GCA/Technology Division for the Environmental Protection Agency, Region I, under contract No. 68-02-1376, Task Order No. 15, is a study of the hydrocarbon emission sources in the following three counties in the State of Massachusetts:

Franklin County
Hampshire County
Hampden County.

Throughout this report the three counties will be referred to collectively as the Pioneer Valley.

The main objective was to identify and analyze the types of hydrocarbon emission sources in the Pioneer Valley. The results were a prerequisite for evaluating possible stationary source regulations and were necessary for the development of transportation control strategies for achieving and maintaining the carbon monoxide and photochemical oxidant air quality standards.

In addition to providing the input to the transportation control strategies, the other objectives were to:

- Idenfity point sources for insertion into the National Emission Data System (NEDS) and Compliance Data System (CDS). All area sources are also to be inserted into the NEDS area source file.
- Estimate and summarize the type and quantity of hydrocarbon sources by source category.

- Forecast best estimates of hydrocarbon emissions in 1975, 1977, 1980 and 1985.
- Assess for each industrial category the available emission control technologies, possible reductions in emissions, the cost of reduction measures, and impact on process and energy utilization.

The results and analyses presented in this report are based on an extensive questionnaire survey and discussions with governmental and industrial sources concerned with the manufacture, distribution and control of hydrocarbons. Good cooperation from the industrial sector and the local agency resulted in an extensive survey coverage. It is felt that the results provide a comprehensive and accurate portrayal of hydrocarbon emissions in the study area.

For the purposes of this study, it was assumed that regulations for stationary sources would be similar to the regulations for the Metropolitan Boston Intrastate Air Quality Control Region and that these regulations would take effect on January 1, 1975 (see Appendix A). The definition of a photochemical reactive solvent as used in this report was taken to be the same as defined in Los Angeles' Rule 66, and as defined in Section 52.1145 of the Federal Register, November 8, 1973.

IDENTIFICATION OF HYDROCARBON EMISSION SOURCES

Hydrocarbons are emitted by the following major categories: fuel combustion of stationary and transportation sources, solid waste disposal, process and evaporative losses, and other miscellaneous sources. Most of the point and area source information for fuel combustion, transportation, solid waste and miscellaneous were obtained from the existing NEDS file and reviewed. An updated version of area sources by city was obtained from the state agency. It was felt that there was no real need to reexamine with questionnaires these points and area sources because of past emphasis placed on these source categories.

The identification of process and evaporative hydrocarbon point sources was accomplished through the mailing of a questionnaire under the jurisdiction of the state agency, to potential sources with subsequent telephone follow-up of nonrespondents. A point source was defined as one emitting in excess of 40 pounds per day (approximately 5 tons per year). A by-product of the above methodology was the gathering of information on industrial stationary area sources. These emissions along with additional estimates for nonrespondents and others based on statistical solvent usage information, were considered as area source emissions for the pertinent source category and apportioned to each city or town.

For the Pioneer Valley 144 establishments were identified as point sources emitting a total of 14,897 tons per year. Approximately 81 percent of this total is photochemically "reactive" solvent. Fifty-eight of these sources were already identified in the NEDS file, mostly as fuel combustion sources. Of the 86 sources responding to the questionnaire; 69 were industrial process sources, 14 were dry cleaners and 3 were bulk petroleum storage facilities. The industrial survey covered about 60 percent of all the manufacturing firms and 87 percent of all manufacturing employees in the region. Of the 427 industrial firms (in operation during the year 1974) contacted, 379 or 89 percent responded by returning the questionnaire or supplying the information over the telephone. All five questionnaires mailed to bulk storage facilities were returned. Only 51 or 29 percent of the 176 dry cleaning establishments responded by mail. It is estimated that the coverage of industrial point sources for the Pioneer Valley exceeds 90 percent because many firms were excluded from the survey mailing because their operations do not use volatile organic compounds, and because of the plant size bias used in the selection of companies.

Table 1 summarizes the point and area source hydrocarbon emissions by major source categories. Emissions from all sources totaled 23,635 tons in 1974. Approximately 76 percent or 17,906 tons is considered to be "reactive" hydrocarbons. As illustrated by Figure 1 the surface coating industry is the major source of hydrocarbon emissions from stationary sources. This category accounted for 63.9 percent of the total. Gasoline marketing was the next largest emitter with 11.4 percent of the total.

Table 1. SUMMARY OF HYDROCARBON EMISSIONS FOR 1974 IN THE PIONEER VALLEY (tons)

Source category	Point source		Area source emissions	Total emissions
	Number[a]	Emissions		
Dry cleaning	14	97	727	824
Degreasing	27	435	153	588
Surface coating	51	11,427	3,676	15,103
Fabric/Rubber	--	(906)	(59)	(965)
Protective/Decorative	--	(554)	(127)	(681)
Printing	--	(1,969)	(271)	(2,240)
Miscellaneous	--	(7,998)	(672)	(8,670)
Trade paints	--	--	(2,547)	(2,547)
Manufacturing	6	1,713	147	1,860
Bulk petroleum storage	3	915	7	922
Fuel combustion[d]	57	299	552	851
Solid waste incineration[d]	1	11	310	321
Gasoline marketing[d]	NA[b]	NA	2,692	2,692
Aircraft, LTO's[d]	NA	NA	52	52
Railroads and vessels[d]	NA	NA	422	422
Total	159	14,897	8,738	23,635

[a] An establishment may be performing operations in more than one source category. Actually 144 establishments are sources.

[b] NA - Not applicable.

[c] ( )- Subcategories.

[d] These categories were not surveyed by questionnaire. Data were obtained from state figures and AP-42.

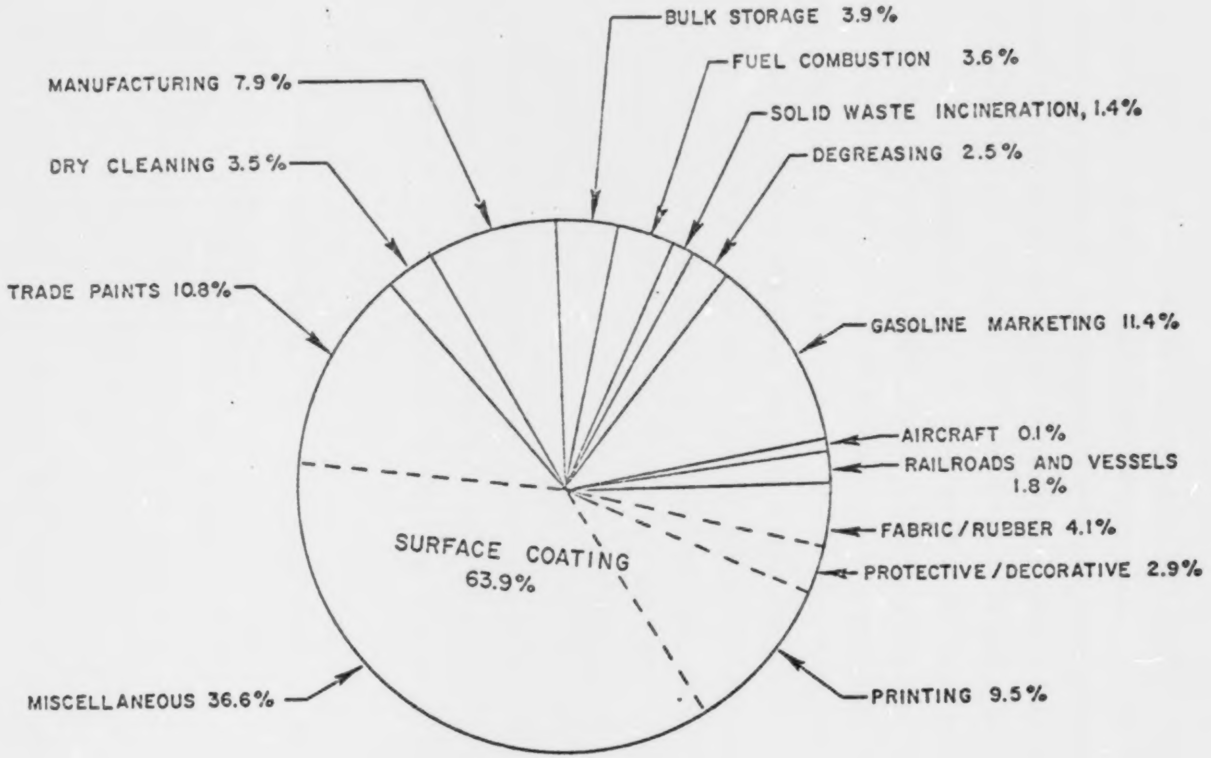

Figure 1. Distribution of total hydrocarbon emissions except from automobile travel (23,635 tons in 1974) in Pioneer Valley

ANALYSIS OF HYDROCARBON EMISSION BY INDUSTRIAL AND OTHER SOURCE CATEGORIES

To obtain industrial emission estimates, a large number of industrial organizations, trade and professional societies, solvent manufacturers and distributors, and control equipment manufacturers were consulted. In many cases they provided valuable inputs to the program. However, in general, reliable estimates of regional solvent usage were not available from these sources. In many instances it was necessary to provide estimations based on regional or national production, sales and distribution figures published in the statistical literature. Sometimes estimates based on such indicators, unfortunately, did not agree with extrapolation of questionnaire survey results, using the best available scaling factors. In most cases where there was a major disagreement, survey results were used as a basis for final emission estimates. This method appeared to be far more reasonable because of the high percent coverage and response to the questionnaire.

The data obtained from the survey was most useful in relating hydrocarbon emissions to Standard Industrial Classifications (SIC) and industrial operations such as degreasing, dry cleaning, surface coating and manufacturing. The procedures and results of the questionnaire survey are defined in Section III. This section considers hydrocarbon emissions in relationship to SIC Categories for the Region. Since the photochemical reactivity of the hydrocarbon emissions from individual point sources is needed to assess the impact of possible regulations, summaries of emissions by chemical makeup and process type are found in Sections IV through VII.

Dry cleaning emissions (Section IV) were based on estimates provided by a representative of one of the largest suppliers of chlorinated hydrocarbons in the area. These estimates were in good agreement with two other estimation methods: one based on AP-42, the other based on a procedure used by the International Fabricare Institute.

Degreasing emissions (Section V) were based on extrapolating the results of the survey to 100 percent coverage. Chlorinated hydrocarbons made up a high percentage of the total reported degreasing solvent emissions. They accounted for approximately 66 percent of the total. Companies classified with SIC Codes 30 through 36 accounted for about 81 percent of degreasing solvent emissions and about 46 percent of the total manufacturing employees in the Region.

The category of solvent usage in industrial surface coating operations (paints, inks, etc.) was the most difficult to assess. First of all, a wide variety of solvents and dilution factors are used. Secondly, the industrial categories using coatings do so for many purposes and use many different types of coatings. Solvent usage figures were available on a national basis for 1972. However, after they were apportioned to the Pioneer Valley area, they were not in close agreement with the survey results. Estimates of solvent usage for these industrial operations were, therefore, based primarily on survey results extrapolated to 100 percent coverage. One exception was the amount of solvent emitted from trade paints. Since population is an excellent indicator for trade paint sales, the national figure for solvent emitted from trade paints was apportioned on this basis to the Pioneer Valley (see Section VI).

Emissions from manufacturing (Section VII) were based strictly on scaled survey results within pertinent SIC Codes.

In the case of gasoline storage and wholesale distribution, basic data were obtained from state and industrial sources. Estimates based on this data should be reasonably accurate and representative of local conditions. Storage information was also obtained from the major bulk storage sites in the area. As described in Section VIII emission calculations were based on API methods found in the "Compilation of Air Pollution Emission Factors," AP-42.

Other emission categories, fuel combustion and solid waste (Section IX), and exclusively area sources (Section X) are relatively minor, except gasoline distribution, when they are looked at in terms of potential emission reduction by control strategies. The distribution of gasoline emissions from service stations were based on state sales figures and emission factors as provided in Supplement No. 1 of EPA Publication AP-42. It was felt that this method was more representative than using the number of registered vehicles or using population.

APPORTIONMENT OF EMISSIONS TO COMMUNITIES

The hydrocarbon emissions from point sources identified by the survey were recorded in the appropriate communities of the study area. Estimated area source emissions from industrial and nonindustrial sources were apportioned to each city or town in the study area. Details of the techniques and factors used to estimate and distribute area source emissions to the communities will be found in subsequent sections. Tables similar to Table 1 have been developed for all communities and can be found in Appendix D of this report. These tables provide point and area source emission data for the various source categories.

PROJECTED EMISSIONS AND EFFECTS OF PROBABLE REGULATIONS

Projected emissions through 1985 are shown in Table 2. These projections are based upon expected growth trends as reported by the Ford Foundation.[1] In order to account for both the past historical growth trends and the uncertainty of government controls on future

Table 2. PROJECTED TOTAL HYDROCARBON AND PHOTOCHEMICAL "REACTIVE" EMISSIONS FOR THE PIONEER VALLEY BY SOURCE CATEGORY (tons/year)

Category	Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control		1980 No control		1980 With control		1985 No control		1985 With control	
		SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV	SSA	PV	SSA	PV	SSA	PV	SSA	PV
Dry Cleaning	-1.0	764 (74)	824 (82)	756 (76)	816 (82)	756 (0)	816 (0)	741 (74)	799 (80)	741 (0)	799 (0)	719 (72)	776 (78)	719 (0)	776 (0)	684 (68)	738 (74)	626 (0)	738 (0)
Degreasing	2.5	516 (144)	588 (212)	529 (148)	603 (218)	529 (1)	603 (12)	556 (158)	633 (232)	556 (5)	633 (7)	598 (169)	682 (246)	598 (6)	682 (7)	677 (193)	772 (283)	677 (9)	772 (10)
Fabric/ Rubberized[c]	2.5	961 (948)	965 (952)	985 (972)	989 (976)	158 (145)	159 (145)	1,034 (1,020)	1,039 (1,025)	166 (152)	167 (153)	1,114 (1,059)	1,119 (1,104)	180 (166)	181 (166)	1,261 (1,244)	1,266 (1,249)	203 (187)	204 (187)
Protective/ Decorative	2.5	634 (603)	682 (650)	650 (618)	699 (666)	297 (61)	355 (72)	683 (649)	734 (700)	330 (64)	375 (65)	735 (698)	791 (754)	355 (69)	404 (71)	832 (791)	895 (854)	384 (77)	438 (82)
Printing	2.5	2,155 (367)	2,239 (373)	2,209 (377)	2,295 (383)	1,740 (11)	1,821 (13)	2,321 (395)	2,411 (401)	1,735 (28)	1,819 (31)	2,499 (426)	2,597 (433)	1,867 (30)	1,958 (34)	2,828 (482)	2,938 (490)	2,113 (35)	2,213 (38)
Miscellaneous Coating	2.5	7,309 (7,039)	8,694 (8,486)	7,492 (7,153)	8,911 (8,604)	2,161 (1,717)	2,276 (1,674)	7,871 (7,281)	9,362 (8,901)	2,912 (2,313)	3,464 (2,851)	8,476 (7,836)	10,082 (9,700)	3,103 (2,463)	3,691 (3,037)	9,590 (8,866)	11,407 (10,841)	3,509 (2,785)	4,175 (3,433)
Trade Paints	2.5	2,222 (667)	2,547 (764)	2,278 (683)	2,611 (783)	2,278 (23)	2,611 (26)	2,393 (718)	2,743 (823)	2,393 (72)	2,743 (82)	2,577 (773)	2,954 (886)	2,577 (77)	2,954 (89)	2,915 (875)	3,342 (1,003)	2,915 (88)	3,342 (100)
Manufacturing	2.5	1,846 (1,120)	1,860 (1,127)	1,894 (1,148)	1,907 (1,155)	554 (266)	558 (268)	1,990 (1,206)	2,003 (1,214)	586 (286)	589 (287)	2,143 (1,299)	2,157 (1,307)	642 (319)	647 (322)	2,425 (1,469)	2,440 (1,478)	745 (329)	730 (341)
Bulk Petroleum	0 1974-75 -2.5 1975-85	921 (921)	922 (922)	132 (132)	133 (133)	92 (92)	92 (92)	125 (125)	126 (126)	88 (88)	88 (88)	115 (115)	116 (116)	81 (81)	81 (81)	103 (103)	104 (104)	72 (72)	72 (72)
Gasoline Marketing	0 1974-75 -2.5 1975-85	2,273 (2,273)	2,692 (2,692)	2,273 (2,273)	2,692 (2,692)	227 (227)	269 (269)	2,161 (2,161)	2,559 (2,559)	216 (216)	256 (256)	2,003 (2,003)	2,372 (2,372)	200 (200)	237 (237)	1,765 (1,765)	2,090 (2,090)	177 (177)	209 (209)
Fuel Combustion	1.9	782 (782)	851 (851)	797 (797)	867 (867)	797 (797)	867 (867)	827 (827)	900 (900)	827 (827)	900 (900)	876 (876)	953 (953)	876 (876)	953 (953)	962 (962)	1,047 (1,047)	962 (962)	1,047 (1,047)
Incineration	0.7	298 (298)	321 (321)	300 (300)	323 (323)	300 (300)	323 (323)	304 (304)	328 (328)	304 (304)	328 (328)	311 (311)	335 (335)	311 (311)	335 (335)	322 (322)	347 (347)	322 (322)	347 (347)
Aircraft	6.0	48 (48)	52 (52)	51 (51)	55 (55)	51 (51)	55 (55)	57 (57)	62 (62)	57 (57)	62 (62)	68 (68)	74 (74)	68 (68)	74 (74)	91 (91)	99 (99)	(91) (91)	(99) (99)
Railroads/ Vessels	3.5	188 (188)	422 (422)	195 (195)	437 (437)	195 (195)	437 (437)	208 (208)	468 (468)	208 (208)	468 (468)	231 (231)	519 (519)	231 (231)	519 (519)	276 (276)	616 (616)	276 (276)	616 (616)
TOTAL		20,919 (15,534)	23,659 (17,906)	20,541 (14,923)	23,338 (17,374)	10,135 (3,888)	11,242 (4,453)	21,271 (15,183)	24,167 (17,819)	11,119 (4,620)	12,691 (5,578)	22,465 (15,978)	25,527 (18,879)	11,808 (4,897)	13,492 (5,925)	24,729 (17,505)	28,101 (20,375)	13,128 (5,458)	15,044 6,623

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

[c] ( ) = Photochemical "reactive" hydrocarbons

energy needs an average growth rate of 2.5 percent was used for all manufacturing industries.[1] Growth rates for other sources of hydrocarbon emissions are presented in Table 3.

Table 3. ANNUAL GROWTH RATES FOR OTHER SOURCES OF HYDROCARBON EMISSIONS

Category	Annual growth rate (%)
Dry Cleaning	-1.0[2]
Gasoline Marketing	0 (1974-1975)
	-2.5 (1975-1985)[3]
Fuel Combustion	1.9[4]
Incineration	0.7[5]
Aircraft	6.0[6]
Railroads and Vessels	3.5[7]

As seen by Table 2, significant reductions in total hydrocarbon and photochemical "reactive" hydrocarbons will be achieved in the Pioneer Valley due to probable regulations. Because of reformulation of existing solvent mixtures and avoidance of control by those emitting less than 40 pounds per day, reductions of photochemical "reactive" hydrocarbons will initially be large and then stabilize. Only a slight increase can be expected due to expansion of currently existing companies and to the development of new firms. By 1975 photochemical "reactive" hydrocarbon emissions will decrease by 75 percent (due to probable regulations) from 17,906 tons to 4,453 tons. The decrease in total hydrocarbon emissions will be 48 percent by 1975 and will once again grow with industrial indicators. Emissions for 1977, 1980 and 1985 with and without probable regulations are also shown in Table 2. It was assumed that the regulations would be immediately effective and compliance would be achieved by January 1, 1975. A definition of photochemically "reactive" hydrocarbons was taken from the regulations for the Metropolitan Boston Intrastate Air Quality Control Region, which are similar to Los Angeles' Rule 66. The criteria for classifying the hydrocarbon mixture as "reactive" were applied only to the emissions from point sources. The ratio of reactive emissions to total emissions from point sources was then used to determine the amount of reactive hydrocarbons that can be expected from the area sources in each major category.

Compliance in the dry cleaning, degreasing, manufacturing and surface coating operations will be achieved primarily by reformulation of existing solvent mixtures rather than through the installation of control equipment. This option is technically feasible, in most instances, and will be followed by most industrial users of solvents. However, some of the larger users of industrial coatings will have to install control equipment. Sometimes such action is economically viable as indicated by the several cases presented in this report and the fact that three large establishments already have recovery control equipment in the study area.

The impact of the probable regulations on petroleum products, (mainly gasoline) storage and distribution will reduce the photochemical "reactive" hydrocarbon emissions in the Pioneer Valley by approximately 14 percent. To achieve a 90-percent reduction in HC emissions from gasoline stations requires controls at gasoline service stations. This in turn requires vapor recovery during tank truck loading at bulk plants and terminals. The most feasible approach is as follows:(16)

Phase I (55 percent control)

1. Modify tank trucks and install the necessary equipment at service stations to recycle the vapors displaced from the underground storage tanks back to the tank trucks during gasoline delivery.

2. Install vapor recovery systems to collect and recover the vapors collected at the service station, as they are displaced from the tank truck during reloading at bulk plants and terminals.

Phase II (35 percent control)

1. Install special gasoline dispensing nozzles, hoses and vapor return lines on the gasoline pumps at the service stations to collect and return vapors displaced from the automobile fuel tank during refueling, to the underground storage tanks at the service station (additional 25 percent control).

2. Install vapor recovery equipment on the underground storage tanks at the service station if necessary, to achieve an overall reduction in emissions of 90 percent at the service station. (additional 10 percent control).

Emissions could be reduced 90 percent, from 2692 tons to 269 tons at gasoline service stations (507) if this type of regulation is adopted. Losses from bulk gasoline storage are currently being reduced by one larger supplier in the area. It is expected that emissions from both storage tank losses and loading rack losses from this company will be reduced by at least 90 percent. If a regulation is applied to all bulk distributors, emissions will drop from 922 tons in 1974 to 92 tons in 1975.

Emissions from the remaining combustion categories will increase with their respective growth rates. Although these emissions are minor they were classified as photochemical "reactive" because they evolve from combustion at high temperatures. Because of the inadequate information available about the photochemical "reactivity" of the numerous hydrocarbon compounds, on which research is actively proceeding, we believe that the above assumptions are subject to change as more knowledge in this area becomes available.[8] Therefore, the reductions for photochemical "reactive" hydrocarbons should not be construed as exact values.

SECTION II

DESCRIPTION OF REGION

This study is concerned with hydrocarbon emission sources in the Pioneer Valley (PV). This region, shown in Figure 2, also encompasses the Springfield study area (SSA), which consists of 26 cities and towns in the immediate area of Springfield. These 26 cities and towns were chosen for a further breakdown because it was felt that the major portion of the emissions in the Pioneer Valley were emanating from this area. Survey results confirmed this assumption, with the SSA accounting for 90 percent of all emissions. Table 4 lists all of the 69 cities and towns in the Pioneer Valley and also indicates the 26 cities and towns in the Springfield Study Area.

The population and number of manufacturing employees for the United States, Pioneer Valley, Springfield-Chicopee-Holyoke SMSA and the Springfield Study Area are given in Table 5. Manufacturing employees according to SIC Classification Codes are listed in Table 6. Major manufacturing industries are paper and allied products, printing, chemicals, primary metal and machinery.

Annual expected growth rates for various categories were compiled from a recent study prepared by the Ford Foundation,[1,3,4,6,7] and are discussed in the various sections of this report.

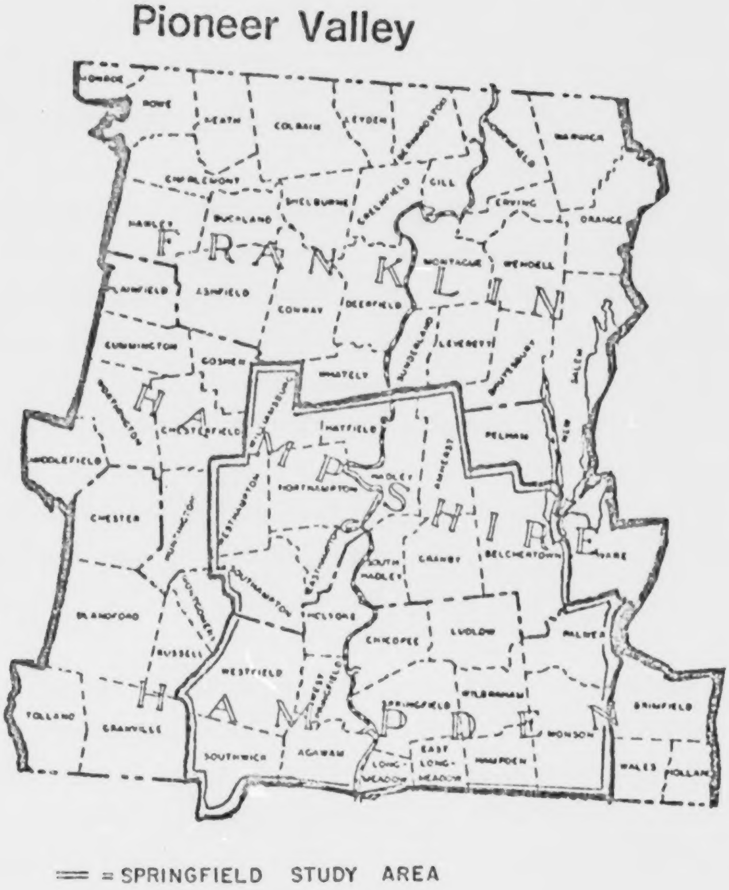
Pioneer Valley
MONROE
ROWE
HEATH
COLRAIN
LEYDEN
BERNARDSTON
NORTHFIELD
WARWICK
CHARLEMONT
SHELBURNE
GREENFIELD
GILL
ERVING
ORANGE
HAWLEY
BUCKLAND
FRANKLIN
MONTAGUE
WENDELL
PLAINFIELD
ASHFIELD
CONWAY
DEERFIELD
CUMMINGTON
GOSHEN
WHATELY
SUNDERLAND
LEVERETT
SHUTESBURY
NEW SALEM
HAMPSHIRE
WORTHINGTON
CHESTERFIELD
WILLIAMSBURG
HATFIELD
AMHERST
PELHAM
MIDDLEFIELD
WESTHAMPTON
NORTHAMPTON
HADLEY
CHESTER
HUNTINGTON
EASTHAMPTON
SOUTH HADLEY
GRANBY
BELCHERTOWN
WARE
SOUTHAMPTON
MONTGOMERY
BLANDFORD
HOLYOKE
CHICOPEE
LUDLOW
PALMER
RUSSELL
WESTFIELD
WEST SPRINGFIELD
HAMPDEN
SPRINGFIELD
WILBRAHAM
BRIMFIELD
TOLLAND
GRANVILLE
SOUTHWICK
AGAWAM
LONG-MEADOW
EAST LONG-MEADOW
HAMPDEN
MONSON
WALES
HOLLAND
═ = SPRINGFIELD STUDY AREA

Figure 2. Pioneer Valley and the Springfield Study Area

Table 4. THE CITIES AND TOWNS IN THE PIONEER VALLEY AND THE SPRINGFIELD STUDY AREA

Agawam[a]
Amherst[a]
Ashfield
Belchertown[a]
Bernardston
Blandford
Brimfield
Buckland
Charlemont
Chester
Chesterfield
Chicopee[a]
Colrain
Conway
Cummington
Deerfield
Easthampton[a]
East Longmeadow[a]
Erving
Gill
Goshen
Granby[a]
Granville
Greenfield
Hadley[a]
Hampden[a]
Hatfield[a]
Hawley
Heath
Holland
Holyoke[a]
Huntington
Leverett
Leydon
Longmeadow[a]
Ludlow[a]
Middlefield
Monroe
Monson[a]
Montague
Montgomery
New Salem
Northampton[a]
Northfield[a]
Orange
Palmer[a]
Pelham
Plainfield
Rowe
Russell
Shelburne
Shutesbury
South Hadley[a]
Southampton[a]
Southwick[a]
Springfield[a]
Sunderland
Tolland
Wales
Ware
Warwick
Wendell
Westfield[a]
Westhampton[a]
West Springfield[a]
Whately
Wilbraham[a]
Williamsburg[a]
Worthington

[a] The 26 cities and towns that make up the Springfield Study Area.

Table 5. POPULATION AND MANUFACTURING EMPLOYEES OF UNITED STATES, PIONEER VALLEY, SPRINGFIELD-CHICOPEE-HOLYOKE SMSA, AND SPRINGFIELD STUDY AREA

Area	Population[a]	Manufacturing employees[a]
United States	203,210,158	19,837,208
Pioneer Valley	642,241	65,819[b]
Springfield-Chicopee-Holyoke SMSA	523,029	61,744[b]
Springfield Study Area	563,323	60,081[b]

[a] 1970 Census
[b] 1973 Massachusetts state, city, and town monographs

Table 6. MANUFACTURING EMPLOYEES IN THE PIONEER VALLEY BY SIC

SIC category	Pioneer Valley	
	Manufacturing employees[a]	~ % of United States total[b]
22 Textiles	1414	0.14
24 Lumber	565	0.12
25 Furniture	365	0.07
26 Paper	7207	1.03
27 Printing	4583	0.43
28 Chemicals	4010	0.40
29 Petroleum	34	0.02
30 Rubber	3021	0.48
31 Leather	1022	0.34
32 Stone, clay	595	0.09
33 Primary metal	4127	0.34
34 Fab. metal products	3973	0.29
35 Machinery	4552	0.24
36 Electrical Machinery	2480	0.13
37 Transportation equipment	333	0.02
38 Instruments	802	0.18
39 Miscellaneous manufacturing	4087	0.96

[a] Division of Employment Security (1973) and City and Town Monographs. Massachusetts Department of Commerce and Development.

[b] U.S. Census (1970).

SECTION III

HYDROCARBON STATIONARY SOURCE IDENTIFICATION

One of the purposes of this study was to identify stationary point sources emitting in excess of 40 pounds per day (approximately 5 tons/year). This was undertaken by means of a stationary source questionnaire. One byproduct of the questionnaire mailing was the gathering of information about small companies that are not point sources. Although these sources are small, they are numerous and represent a substantial portion of the total hydrocarbons emitted. The emissions from these area sources were included in the NEDS area source file.

Hydrocarbon stationary sources can be broken down into the following categories: fuel combustion, solid waste, process and evaporation sources and miscellaneous. Fuel combustion includes the burning of coal, oil, gas, and wood for residential, commercial, institutional, and industrial use. Solid waste stationary sources consist of on-site incineration. Point and area source information for fuel combustion, solid waste and miscellaneous sources were obtained from the existing NEDS file and reviewed with published literature information. It was felt that there was no need to further re-examine these point and area sources because of past emphases placed on these sources.

The rest of this chapter discusses the procedure for surveying process and evaporative stationary sources, the results from the returned questionnaires, the extrapolated survey emission estimates and the overall emission estimates based on the survey and additional published and unpublished information.

PROCESS AND EVAPORATIVE SOURCES

Questionnaire Design

Questionnaires were designed for three types of establishments: manufacturing industries, drycleaners and bulk petroleum and petrochemical distributors. They will be described briefly below.

Manufacturing Industries - The operations that frequently emit hydrocarbons from the manufacturing industries are:

1. Degreasing
2. Surface coating
    a. Fabric or rubberized
    b. Protective or decorative
    c. Printing
    d. Miscellaneous surface coating
3. Other manufacturing operations
    a. Process losses
    b. Bulk storage

The questionnaire sent to manufacturing industries is shown in Appendix B, Table B-1. On the first page, general information is requested. Plant name and mailing address, plant address, person to contact, number of manufacturing employees, etc., are required for identification, scaleup and completion of NEDS. To assist the respondent, a guide is provided indicating the pages that should be completed for the type of operation(s) performed at the plant. If the plant does not emit hydrocarbons, the individual signs the form and returns it so he will not be recontacted.

Degreasing - In many industries, the fabricated product must be degreased before surface finishing. Firms involved in degreasing operation(s) are asked to identify the amount and type of solvent(s) purchased and returned to the supplier for reprocessing. The major solvents, Stoddard, 1,1,1-trichloroethane, perchloroethylene, methylene chloride, and trichloroethylene are listed on the questionnaire.

Surface coating - The section of the questionnaire concerning surface coating, was handled carefully because solvents are added to the purchased coating. A distinction must be made between quantity of coating purchased and its solvent content, and the quantity of solvent added to the coating for dilution. The amount of solvent used for cleaning purposes was also requested. The respondent also was asked to identify the type and percentage of the major solvents used in the coating.

Other manufacturing operations - Operations that do not classify as degreasing or surface coating operations are placed in this category. Examples are: asphalt roofing, petroleum industry, plywood/particle board products and chemical manufacturing. Space is provided to describe the process or operation, to indicate the material being processed, to indicate the throughput at the source and to indicate the percentage and types of solvents being used and lost to the atmosphere.

In order to fill out a NEDS form for a point source, one last page of information is needed which concerns itself with control equipment and stack information. Every piece of equipment that has been mentioned in any previous page of the questionnaire was to be given a unique source identification number. This number is used to match a piece of control equipment or a stack to the proper operating equipment. Questions that are asked in this section follow:

- Name of the process or operation with a stack and/or control equipment
- Type of control equipment

- Efficiency of the control equipment and its date of installation.

The date of installation serves as a check on the reported efficiency of that equipment. If a piece of equipment is 50 years old and it is reported at 99 percent efficiency, a reasonable doubt exists as to the reported values. Information was asked about the stack height, inside diameter, temperature of gas, velocity and flow rate.

Dry Cleaning - Dry cleaning is the second category for which a questionnaire was developed. It was incorporated into the manufacturing industries questionnaire as shown in Table B-1. Page 2 is completed instead of pages 3 to 8. General, stack, control and bulk storage information remains the same. Dry cleaners use basically two types of solvents; perchloroethylene and Stoddard Solvent. The users of Stoddard Solvent will, in almost all cases, use a type of process called a transfer machine. It is called a transfer process because after the clothes are washed they are transferred to a separate dryer. The physical process of moving the wet clothes results in a large evaporative loss. A second type of process used is a dry-to-dry machine. This process does not involve a transfer of clothes; the drying cycle is performed in the same machine as the washing cycle. The question of what type of process is being used was included in order to check the usage figures of solvents. For the same amount of clothes cleaned and for the same type of solvent being used, the transfer process should use more solvent than the dry-to-dry process.

Bulk Storage of Petroleum and Petrochemicals - The last major category is bulk storage of gasoline and other petroleum and petrochemicals. In order to obtain information about solvent storage tanks an abbreviated form of a bulk storage section was sent to all manufacturing industries (Section VII of Questionnaire). This shortened form asks for information concerning solvent types, capacity of the tank, annual throughput, and fill and control equipment.

The complete form, Table B-2, was sent to all major oil companies, petroleum and petrochemical distributors, and airports that have large bulk storage tanks. The questionnaire asks for information such as tank dimensions, paint on tank, average vapor space height, type of roof, vapor pressures of liquid, etc. This information was used to calculate tank emissions based upon methods described in the "Compilation of Air Pollution Factors AP-42."

Development of Mailing List

A mailing list of potential hydrocarbon emission sources was compiled from these sources:

- Computer listing from Division of Employment Security
- State Department of Corporations and Taxation
- Dun and Bradstreet, Industrial Directory
- Yellow Pages of telephone directories
- Thomas Register
- Existing NEDS and CDS for the state.

The selection of companies to be contacted was based on their SIC classification, with consideration given to their size and the nature of their actual operations. Information from a previous study was also used to identify probable hydrocarbon sources. Table 7 indicates some SIC classes that are likely to emit hydrocarbons.

Petroleum products, bulk storage facilities and dry cleaners were completely surveyed. A list of bulk stations and terminals was obtained from the following sources:

1. State Air Pollution Control Agency
2. New England Yellow Pages.

Table 7. SIC CLASSES SURVEYED

SIC	Category	Specific selection
22	Textiles	Coatings (2295), Non-wovens (2297), Dyeing (2231)
24	Lumber and wood	Finished prod. (2435), (2492)
25	Furniture and fixtures	SIC: (2511), (2514), (2521), (2522), (2542)
26	Paper	Bags, box (2643), (2651), (2653) Coated papers (2641)
27	Printing	Newspaper publishing (2711) Comm. printing (2751), (2754)
28	Chemicals	Organic chemical mfg. (2821), (2823), (2861), Chemical coating (2851), Specialty chemicals (2842), Carbon black (2895)
29	Petroleum	All companies
30	Rubber, plastic	Footwear (3021), Plastics (3041), (3069)
31	Leather	Mfg. shoes (3149), Bags (3161), Personal goods (3172), Leather refinishing (3111)
32	Stone, clay, etc.	Glass products (3221)
33	Primary metal	Treating (3398), Tubing (3357)
34	Fab. metal	Screws (3451-2), Metal stampings (3469), Plating (3471), Tool mfg. (3423), (3429)
35	Machinery	Industrial machines
36	Elect. machinery	Devices (3643), Semicond. (3674)
37	Transpt. equip.	Boats (3732), Truck bodies (3711, 3713, 14, 15)
38	Instruments	Optical frames (3832) Precision instruments (3825)
39	Miscellaneous Mfg.	Jewelry (3914-15), Toys (3944) Writing instr. (3951, 53)
5171	Bulk terminals	All surveyed
7216	Dry cleaning	All surveyed

A list of dry cleaning establishments was obtained from the Yellow Pages and from the Regional Dry Cleaning Trade Association.

The lists were put into alphabetical order by city to help facilitate data handling. The questionnaires were then mailed with general instructions and a cover letter from the state agency, Appendix C.

Telephone Follow-up

As a result of diligent telephone follow-up on non-responding companies, the overall response to the questionnaire mailing was high. About 70 percent of the companies surveyed submitted completed questionnaires. An additional 20 percent supplied the needed information over the telephone. Of the non-respondents, a few are felt to be probable sources and have been identified as such in a listing submitted to the EPA Project Officer. Recontacting was stopped when there appeared to be an obvious reluctance or unwillingness to supply information on the part of the industrial firm. Although the validity of information determined by telephone may be subject to question, many responding by telephone were point sources.

Computerization of Survey

Of major importance in subsequent analyses of survey results is the development of a proper data handling system. Such a system is needed to allow the numerous data elements required for subsequent tabulation and analysis to be handled and retrieved in an efficient manner.

For questionnaire mailing, only the firm name, address, and identification number is required. However, more specific information is needed for data analysis. This information includes SIC codes, process information, solvents used, emission estimates, control equipment, and stack information. It includes all of the information required for completion of NEDS forms plus other specific information such as firm size and solvent identification. Computerization was considered, and used to some extent for the printing of mailing labels and work sheet listings of firms. The list was prepared alphabetically by city, and by identification number.

The approach that GCA took was to initially obtain a computer tape from the Division of Employment Security. This tape contained the names and addresses of almost every company in the state. A program was then developed to select companies in pertinent SIC categories. This tape of selected firms was then used to produce the address and identification lables, and to develop worksheets for monitoring and analyzing the questionnaire returns. Further computerization of the response data was not undertaken. Firms not listed on the original state tape were noted by the local state office and added to the list of selected firms.

Responding firms were listed on NEDS forms, if major sources, and grouped according to SIC classification on worksheets. Worksheet information included the firm name, address, identification code, and number of employees, total emissions for each solvent emitted and a standard classification codes (SCC) describing the nature of the process. These work sheets then formed the basis for the tabulations and analyses given in the following sections of this report.

Coding of NEDS and CDS Source Form

Point source information was coded on NEDS forms in accordance with the "Guide for Compiling a Comprehensive Emission Inventory" - APTD 1135. Potential emitters of 100 tons per year of hydrocarbons were entered on CDS forms.

RESULTS OF THE SURVEY

The extent of the Pioneer Valley survey coverage and the resulting emissions are summarized in Table 8 for the various SIC codes comprising the industrial sector, the petroleum bulk storage facilities, and the dry cleaners. Point and area source emissions are given for each SIC category. Also, shown are the reported survey totals and the calculated survey total estimates. The estimated survey emissions were based on percent survey coverage information and any additional estimates from national or regional figures.

RESPONDING COMPANIES

A total of 653 questionnaires were mailed to firms in the Pioneer Valley. As a result of telephone follow up about 89 percent of the industrial firms responded. Without telephone recontacting the overall response rate would have been only 50 to 60 percent. Response from dry cleaners was only 29 percent and no telephone follow-up was conducted.

Of those responding, 86 industrial firms and dry cleaners reported emissions greater than 5 tons per year. Total reported emissions from industrial firms and dry cleaners were 14,794 with point sources accounting for 98.6 percent of the total and over 60 percent of all estimated emissions for the region.

Sources are classified according to their emission output in Table 9. Emissions were generally calculated using either engineering knowledge and supplied information about the process or AP-42 emission factors. Sometimes emission estimates were made by the responding company. As can be seen from the tables, a relatively few number of sources account for the major portion of the emissions.

Table 8. SURVEY COVERAGE AND EMISSIONS FOR THE PIONEER VALLEY (TONS)

		In Pioneer Valley			Companies responding											
					Point sources			Area sources			Nonsources					
SIC	Category	No. of companies	No. of employees	No. of companies surveyed	No. of companies	No. of employees	HC emission	No. of companies	No. of employees	HC emission	No. of companies	No. of employees	OOB	% response of co. surveyed	% response of employees in region	Estimated additional emissions	Total estimated HC emission
22	Textiles	22	1,414	14	1	100	8	1	100	1	7	1,175	5	100	97	0	9
24	Lumber	59	565	21	1	85	31	1	12	1	14	281	4	94	67	17	49
25	Furniture	23	365	13	0	--	--	3	85	6	9	186	0	92	74	2	8
26	Paper	58	7,207	51	15	3,453	7,435	11	1,566	24	17	1,566.	2	88	92	650	8,109
27	Printing	122	4,583	63	8	2,280	742	17	468	34	25	1,254	3	53	87	116	892
28	Chemicals	40	4,010	25	8	3,046	1,145	2	298	4	10	488	3	91	96	50	1,199
29	Petroleum	4	34	2	--	-----	-----	--	---	--	2	25	0	100	74	0	0
30	Rubber	40	3,021	27	5	2,000	2,555	2	93	4	16	747	2	92	94	163	2,722
31	Leather	5	1,022	4	1	960	32	--	---	--	2	60	1	100	99	0	32
32	Stone, clay	24	595	12	--	-----	-----	3	226	4	7	277	1	91	85	0	4
33	Primary metal	32	4,127	26	3	860	37	3	640	6	16	1,617	1	88	76	14	57
34	Fab. metal prod.	94	3,973	63	13	1,734	238	9	665	18	29	997	5	68	85	49	305
35	Machinery	174	4,552	88	8	1,613	236	11	710	20	56	1,477	6	91	83	50	306
36	Elect. mach.	29	2,480	18	2	1,192	113	5	353	9	6	498	4	93	82	27	149
37	Trans. equip.	12	333	8	--	-----	-----	1	105	4	3	105	2	67	63	2	6
38	Instruments	14	802	9	2	645	300	--	---	--	6	92	-	89	92	26	326
39	Misc. mfg.	48	4,087	24	2	1,770	705	5	337	8	11	1,394	0	82	86	118	831
	Subtotal	802	43,170	468	69	19,738	13,577	74	5,658	143	236	12,261	41	89	87	1,284	15,004
5153	Bulk storage	5	------	5	3	------	915	2	-----	7	---	------	--	100	—	0	922
7215	Dry cleaning	180	------	180	14	------	97	23	-----	55	14	------	4	29	—	672	824
	Trade paints	---	------	---	--	------	------	--	-----	--	---	------	--	—	—	2,547	2,547
	Gasoline market	---	------	---	--	------	------	--	-----	--	---	------	—	---	—	2,692	2,692
	Aircraft LTO's	---	------	---	--	------	------	--	-----	--	---	------	—	—	—	52	52
	Fuel comb.	---	------	---	57	------	299	--	-----	--	---	------	—	—	—	552	851
	Incineration	---	------	---	1	------	11	--	-----	--	---	------	—	—	—	310	321
	Railroads and vessels	---	------	---	--	------	------	--	-----	--	---	------	—	—	—	422	422
	Total	987		653	144		14,897	99		205	250		45	73		8,533	23,635

Table 9. NUMBER OF POINT SOURCES AND THEIR EMISSIONS AS REPORTED BY THE SURVEY (1974)

Emission size (tons/year)	Number of point sources	Percent of total	Point source emissions (tons/yr)	Percent of total
5 - 25	51	60	495	3
26 - 100	19	22	1019	7
101 - 500	10	12	2641	18
501 - 1000	3	3	2254	16
1001 - 5000	3	3	8180	56
Totals	86	100	14589	100

SCALE-UP OF SURVEY

The reported emissions by SIC for each category (degreasing, printing, etc.) were scaled-up to a 100 percent coverage based on the number of manufacturing employees within each SIC. Therefore, the non reported emissions in each SIC were calculated as follows:

$$\text{Nonreported emissions} = \frac{\text{(Reported Emissions)}}{\text{Coverage fraction}} - \text{(Reported Emissions)}$$

The coverage fraction was that portion of the total manufacturing employees responding in each SIC divided by the total reported by the Division of Employment Security adjusted for firms that were found to be missing from this list. This assumes that emissions are proportional to the total number of manufacturing employees within the pertinent SIC codes.

In some cases emission estimates did not agree with estimates based on local, regional, or national consumption figures broken down by appropriate indicators. When addition estimates were felt to be appropriate as with dry cleaners, they were apportioned to the pertinent SIC codes. For dry cleaners, because there is only one major SIC (7216) involved, all additional emissions were apportioned to this SIC. The total nonreported and additional estimated emissions were considered area sources (nonidentified point sources and area sources), and were reapportioned to each city or town based on manufacturing employees.

The reported emissions accounted for 77 percent of the total estimated 19,297 tons per year from manufacturing, dry cleaning and bulk petroleum storage. Reported and total estimated hydrocarbon emissions from these categories are given in Table 10.

Table 10. REPORTED AND TOTAL ESTIMATED POINT AND AREA SOURCE EMISSIONS FOR PIONEER VALLEY AS A RESULT OF QUESTIONNAIRE

	Reported emissions (Tons 1974)	Total estimated emissions (Tons 1974)
Dry cleaning	152	824
Degreasing	499	588
Surface Coating[a]	11501	15103
Trade Paints	(0)	(2547)
Protective/Decorative	(581)[b]	(681)
Printing	(2010)	(2240)
Fabric/Rubber	(906)	(965)
Miscellaneous	(8004)	(8670)
Paper Industry	((6043))	((6571))
Manufacturing	1717	1680
Bulk Storage	922	922
Totals	14,794	19,297

[a] Surface Coating - does not include emissions from trade paints

[b] ( ) - subentries

SECTION IV

DRY CLEANING

The purpose of this section is to evaluate the contribution of the dry cleaning industry to the hydrocarbon problem in the Pioneer Valley. The emissions from this industry are due to two types of solvents, Stoddard and perchloroethylene. About 80 percent of the perchloroethylene produced annually is used as a dry cleaning solvent. The remaining 20 percent is used for chemical intermediates and vapor degreasing.[9]

A survey of dry cleaners was undertaken to determine the contribution of hydrocarbons from this industry. A total of 180 questionnaires were mailed to dry cleaners in the study area. This list was compiled by using the Yellow Page Directories and a list obtained from the Regional Dry Cleaning Trade Association. It is believed to contain nearly every dry cleaning facility in the area. The post office returned four questionnaires and these were considered to be out of business.

RESULTS OF THE SURVEY

Table 11 shows the results of the survey for the Pioneer Valley. Out of 176 existing companies, 51 responded, representing 29 percent of the industry. Fourteen point sources were determined to be emitting a total of 97 tons of solvent. Of these, one firm was emitting 7 tons of Stoddard solvent. Twenty-three area sources reported 55 tons of emissions. Additional emissions are estimated to be 372 tons based upon extrapolation of the results of the questionnaire to 100 percent

Table 11. SURVEY RESULTS FOR DRY CLEANERS IN PIONEER VALLEY

City	No. of questionnaires mailed	No. out of business	% return	Point sources		Area sources		No. firms with no emissions	No. nonrespondants	Estimated area emissions	Reported area and established area emissions	Total emissions
				Number	Tons	Number	Tons					
Agawam	10	0	10	0	0	1	1	-	9	48	49	49
Amherst	4	0	0	0	0	0	0	-	4	22	22	22
Chicopee	15	0	20	1	6	1	3	1	12	65	68	74
E. Hampton	3	0	100	0	0	2	6	1	0	0	6	6
E. Longmeadow	2	0	0	0	0	0	0	-	2	11	11	11
Greenfield	7	0	0	0	0	0	0	-	7	38	38	38
Hampden	1	0	0	0	0	0	0	-	1	5	5	5
Holyoke	25	1	33	3	22	3	7	2	16	86	93	115
Longmeadow	2	0	50	0	0	0	0	1	1	5	5	5
Ludlow	6	0	50	1	5	2	7	-	3	16	23	28
Monson	1	0	0	0	0	0	0	0	1	5	5	5
Northampton	7	0	14	0	0	1	3	0	6	32	35	35
Orange	2	0	0	0	0	0	0	0	2	11	11	11
Palmer	3	0	0	0	0	0	0	0	3	16	16	16
Southwick	2	0	100	0	0	2	2	0	0	0	2	2
Springfield	56	3	25	8	57	2	5	3	40	215	220	277
Ware	3	0	100	1	7	2	2	0	0	0	2	9
Westfield	8	0	38	0	0	3	6	0	5	27	33	33
W. Springfield	16	0	50	0	0	3	9	5	8	43	52	52
Wilbraham	3	0	33	0	0	0	0	1	2	11	11	11
Williamsburg	4	0	25	0	0	1	2	0	3	16	18	18
Total	180	4	29	14	97	23	55	14	125	672	727	824

response. However, on the basis of conversations with major manufacturers and suppliers of dry cleaning solvents, we estimate that the additional emissions should be 672 tons.[10,11] This figure is also in close agreement with the estimate using population and the EPA consumption factor of 2.7 pounds per person per year adjusted for cold climates.[12] The 672 tons of additional area sources emissions were apportioned to each city or town based upon the number of establishments that did not respond.

TYPE OF CONTROL EQUIPMENT AND COST

The principal source of emissions from a dry cleaning operation using Stoddard solvent occurs during the drying cycle from the tumbler. Losses from a perchloroethylene plant differ from a Stoddard solvent plant. Perchloroethylene is lost mostly from filter muck and distillation residue, not from the tumbler.[13] Poor operating practices are also a source of emissions.

The following is a list of probable places for solvent losses:

1. Open button traps
2. Open solvent buckets: solvent drains from vapor adsorbers, tumblers, etc.
3. Open dip tanks
4. Open base tanks
5. Broken gaskets on washer and tumbler doors
6. U-tube water separators with no water on top of solvent layer
7. Washer, tumbler, and cooker door gaskets compressed from too long usage without replacement
8. Inoperative washer suction fan (should pull room air into washer when door is opened)
9. Bad joints on machine duction
10. Mechanical problem on washer which prevents full extraction (transfer machines)
11. Too short extraction time (transfer machines)

12. Too short drying time
13. Loose pipe joints dripping solvent
14. "Temporary" repairs of equipment that are never fixed properly
15. No floor inlets - vapor adsorber
16. Blocked floor inlet - vapor adsorber
17. Insufficient or infrequent stripping of vapor adsorber
18. Tumbler aerate inlet dampers not sealing tightly (due to weak spring, etc.)

Technology is available to reduce hydrocarbon emissions from Stoddard operations, however, it is not economically advantageous. Because Stoddard solvent is flammable and considered to be of moderate recovery, it will probably be replaced by perchloroethylene or a "nonreactive" Stoddard solvent.

Control technology for the recovery of solvent emissions from a perchloroethylene plant are well known and control equipment has been available for many years. Carbon adsorption is a process which will pay for itself within three years of its purchase. A typical unit that will recover up to 1-3/4 gallons per steamout is about $1,250. Operating costs are estimated to be about 20 cents/hour for electricity, water, and steam. Maintenance on the unit for the first few years should come to less than $250 annually.[14,15]

EFFECTS OF PROPOSED REGULATIONS AND PROJECTED EMISSIONS

If a regulation took effect on January 1, 1975, it is expected that all major users of Stoddard solvent would switch their operations to perchloroethylene or a "nonreactive" Stoddard solvent. An estimate of the survey shows that approximately 10 percent of all dry cleaning emissions are from Stoddard solvent. Only one plant reported using Stoddard solvent. Representatives of the dry cleaning industry anticipate that the industry will decline at a rate of approximately 1 percent per year for the next several years. This is due to the present economy and to changes in today's fabrics. Expected emissions for 1975, 1977, 1980 and 1985 are shown in Table 12. This table takes into account the effects of possible regulations and a 1 percent decrease in growth per year. The numbers in parenthesis are photochemical "reactive" emissions. They are mainly from the use of Stoddard solvent. As can be seen from this table a very small reduction in photochemical reactive solvent can be expected from this industry.

Table 12. DRY CLEANING EMISSIONS FOR 1974, 1975, 1977, 1980 AND 1985

Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
	SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
-1.0	764 (76)	824 (82)	756 (76)	816 (82)	756 (0)	816 (0)	741 (74)	799 (80)	741 (0)	799 (0)

Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
	SSA	PV	SSA	PV	SSA	PV	SSA	PV
-1.0	719 (72)	776 (78)	719 (0)	776 (0)	684 (68)	738 (74)	684 (0)	738 (0)

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

( ) = Photochemical "reactive" hydrocarbon

SECTION V

DEGREASING

There are two types of degreasing operations, vapor degreasing and cold cleaning, which are used to clean surfaces, usually as a preparation for subsequent coating or joining processes. Chlorinated solvents and Stoddard solvents are commonly used for both the vapor and cold cleaning methods. Most of the solvent purchased evaporates to the atmosphere. The remainder, which contains the oil material degreased, is either recycled internally, reclaimed by the supplier or discarded.

RESULTS OF THE SURVEY

Degreasing operations are carried out in the region by companies involved with metal working, machinery and electrical goods. These companies are classified within SIC codes 33 to 36 and accounted for 70 percent of all degreasing emissions.

Table 13 shows the extent of the survey coverage and the resulting hydrocarbon emissions from degreasing operations. In the survey, 195 companies within SIC codes 33 to 36 were contacted. Responses were obtained from 177 of them. Of the responding companies, representing about 82 percent of the region's employees in the 33 to 36 SIC codes, 21 were found to be point sources emitting a total of 305 tons. Another 6 sources were found in other SIC categories emitting 130 tons. Total reported emissions were 499 tons per year, with point sources accounting for 435 tons per year. Using the coverage index of each SIC, an additional 89 tons

Table 13. SURVEY COVERAGE AND EMISSIONS FROM DEGREASING

SIC	Stoddard	1,1,1-trichloroethane	Perchloroethylene	Methylene chloride	Trichloroethylene	Other	Emissions reported	% of employee coverage	Scale up emissions	Total emissions
22	4	4					8	97	0	8 (0)
26		(6)	(1)		(3)	(5)	0 (15)	92	(1)	0 (16)
27		29	16			(1)	(1)	87	(7)	45 (8)
30		14		18 (1)	4	25	61 (1)	94	(3)	61 (4)
32						(1)	0 (1)	85	(0)	-1 (1)
33	(2)	8	19		(3)		27 (5)	76	(10)	27 (15)
34	8	19	9 (5)	(1)	48 (1)	34 (6)	118 (13)	85	(23)	118 (36)
35	8	10 (2)	9 (5)		20 (2)	63 (4)	110 (13)	83	(25)	110 (38)
36	1	3 (3)		27	18	1 (4)	50 (7)	82	(13)	50 (20)
37		(3)	(1)				0 (4)	63	(2)	0 (6)
38		16					16 (0)	92	(1)	16 (1)
39		(1)	(1)			(2)	0 (4)	86	(1)	0 (5)
Totals	21 (2)	103 (15)	53 (13)	45 (2)	90 (9)	123 (23)	435 (64)	87	(39)	435 (153)

( ) - Area sources.

per year are estimated from nonresponding companies. This total is under the local suppliers estimate of approximately 850 tons used in the area.[10] The lower figure of 588 tons per year was chosen as being more representative of the study area because of the high percent return of the questionnaire and because of the nature of the businesses in the area. The difference between the total estimated emissions and the reported point sources become the area source total of 153 tons/year. These emissions were apportioned to municipalities by total manufacturing employees in the community.

Chlorinated solvents are the most widely used degreasing solvents. They make up about 70 percent of the total reported degreasing solvent emissions. 1,1,1-trichloroethane accounts for about 25 percent of all solvents used and trichloroethylene accounts for about 20 percent of all solvents used. Nonchlorinated hydrocarbon emissions are from Stoddard solvent and other aliphatic and aromatic hydrocarbons.

Table 14 below, classifies the companies by size. This table shows that many companies are emitting between 6 and 15 tons per year and that a relative few are emitting a good portion of the total.

Table 14. CLASSIFICATION OF DEGREASING SOURCES BY SIZE FOR THE PIONEER VALLEY

Emission size (tons/yr)	Number of point sources	% of total	Point source emissions (tons/yr)	% of total
1-5	5	19	15	3
6-15	11	40	94	22
16-25	5	19	90	21
26-50	6	22	236	54
Total	27	100	435	100

CONTROL EQUIPMENT

Control methods for solvent emissions from degreasing operations are largely concerned with reducing the solvent emitted from the tank. Degreasing equipment manufacturers estimate that the emission rate is in the range of 0.5 to 1.0 $lb/hr/ft^2$ of open tank area. Treatment of exhaust gases has received less attention. Of the available exhaust gas treatments, activated carbon adsorption may not prove practical. This is true for commercial grades of 1,1,1-trichloroethane. Incineration is not feasible for chlorinated hydrocarbons, since they degrade to form toxic compounds in the incinerating flame.

Measures designed to reduce tank emissions include the use of a cover, if possible, the elimination of drafts over open tanks, improved operating and safety procedures such as good temperature control to prevent overboil, refrigerated cooling jackets, safety measures to prevent, for example, operation of the unit if the refrigerant flow is stopped or reduced and proper drainage of work pieces. Table 15 taken from a recent EPA study,[16] indicates the savings that can be realized if some of the above procedures are followed. The baseline for this data is a tank emitting 0.825 $lb/hr/ft^2$ of trichloroethylene over an 8 hour per day, 5 days per week operation. Although carbon adsorption is the most effective means of reducing emissions, there is a high capital cost involved relative to the price of the degreasing unit. As the cost of solvent increases, due to higher costs of crude oil, a carbon adsorber recovery system will eventually pay for itself.

No simple universal formula can be used to determine the required carbon adsorption capacity for a solvent recovery system. However, in general calculations for determining adsorber unit size are patterned after the following method. Solvent consumption records for

Table 15. DEGREASER CONTROL COSTS[16 and 32]

	Case 1	Case 2	Case 3
Control equipment	Temperature controls plus good operation 40 percent control	Case 1 plus refrigerated coils 50 percent control	Carbon adsorption 90 percent control
Emissions to atmosphere lb/hr/ft^2	0.50	0.41	0.08
Capital cost ($)[a]	300	3,000	6,500
Net annual cost or (savings) ($/yr)	(1,428)	(1,070)	(1,200)

[a] The basic degreaser unit cost is about $2,000.

a given calendar period of work days are used to estimate the hourly solvent loss by evaporation during manufacturing operations. Using the known efficiency or activated carbon for adsorbing the particular solvent, the amount of carbon required to adsorb the solvent vapor can be calculated. The required rate of solvent-laden air flow can then be determined, since it is known empirically that under average bed conditions 100 lb of carbon can efficiently treat 200 cu ft/min of solvent-laden air/hr.[14]

Example: A vapor degreasing line is known to lose approximately 75 lb of trichlorethylene/hr.
Calculation: From Table 16 we fine that the carbon adsorption efficiency for trichlorethylene is 15 percent. This means that the amount of solvent adsorbed by 100 lb of carbon would be 15 lb, so for adsorbing 75 lb in an hour the requirement would be:

$$75 \times \frac{100}{15} = 500 \text{ lb of carbon.}$$

Table 16. SELECTED DATA OF COMMONLY USED SOLVENTS (14)

Solvent	Lower explosive limit (percent by volume in air)	Carbon adsorption efficiency (percent)
Acetone	2.15	8
Benzene	1.4	6
n-Butyl acetate	1.7	8
n-Butyl alcohol	1.7	8
Carbon tetrachloride	n	10
Chloroform	n	10
Cyclohexane	1.31	6
Ethyl acetate	2.2	8
Ethyl alcohol	3.3	8
Heptane	1	6
Hexane	1.3	6
Isobutyl alcohol	1.68	8
Isopropyl acetate	2.18	8
Isopropyl alcohol	2.5	8
Methyl acetate	4.1	7
Methyl alcohol	6.0	7
Methylene chloride	n	10
Methyl ethyl ketone	1.81	8
Methyl isobutyl ketone	1.4	7
Perchlorethylene	n	20
Toluene	1.27	7
Trichlorethylene	n	15
Trichloro trifluoroethane	n	8
VM & Naphtha	0.81	7
Xylene	1.0	10

This is the minimum amount of carbon needed in one bed, through which vapors are to be passed for a period of one hour. As noted above, 100 lb of carbon efficiently handles a volume flow rate of 200 cu ft/min. Therefore: $500 \text{ lb carbon} \times \frac{200 \text{ cu ft/min}}{100 \text{ lb carbon}} =$ 1,000 cu ft/min, the maximum rate of air flow required for this quantity of trichlorethylene. In practice, these figures would be optimized to meet the particular recovery requirements of the individual installation.

The initial hardware costs, operating costs and return on investment for a solvent adsorber system will, of course, vary depending on the size of the system, the type of solvent vapor processed, and the volume of solvent used.

A typical unit designed to handle 1000 cu ft of solvent-laden air/minute would cost between \$6,000 and \$7,000. The installation cost can be estimated to run about 20 percent over and above the price of the unit.[32]

Operating costs have been found to average out at 10¢/hr for electricity, 5 to 6¢/hr for water and 15¢/hr for steam, depending on local utility rates. Maintenance on the unit for the first four to five years should come to less than \$200 annually.[32]

The rapid return on investment for a solvent adsorber can be seen in the example for a plant using 6,000 gal/yr of a typical chlorinated solvent costing \$2.00/gal, or \$12,000. At a solvent recovery rate of 75 percent--an extremely conservative estimate and readily exceeded in most cases—the first-year savings would amount to \$1,200. At this rate, the cost of the unit plus installation (\$7,800) could be recovered completely in less than a year. Therefore, the claim that a solvent recovery system based on activated carbon literally pays for itself, can be documented.(14),(32)

PROJECTED EMISSIONS FROM DEGREASING

It has been assumed, for the purpose of projecting emissions, that a regulation similar to the regulations in the Metropolitan Boston area will take effect on January 1, 1975. These regulations will have a significant impact on establishments emitting 5 or more tons per year of trichloroethylene and Stoddard solvent which are considered photochemical "reactive." These establishments will be required to control emissions by at least 85 percent or replace the solvent with another nonreactive solvent. The regulation currently exempts perchloroethylene, methylene chloride and 1,1,1-trichloroethane. As in other areas where this type of legislation is in effect, trichloroethylene will be almost entirely replaced. Only those establishments using less than 5 tons per year will probably continue to use it. However, there will be some firms who for technological reasons, cannot replace trichloroethylene or reduce emissions below 5 tons per year. These companies will be required to expend considerable capital investment for carbon adsorption equipment.

The following projections for 1975, 1977, 1980 and 1985 are based on a 2.5 percent growth rate for the industry. This rate is based upon historical trends and estimates of the nation's growth due to the energy crisis.[1] Table 17 presents these projections with and without controls in effect.

Table 17. PROJECTED DEGREASING SOLVENT EMISSIONS IN THE PIONEER VALLEY

Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control	
	SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV
2.5	516 (144)	588 (212)	529 (148)	603 (218)	529 (1)	603 (12)	556 (158)	633 (232)

Annual Growth (%)	1977 With control		1980 No control		1980 With control		1985 No control		1985 With control	
	SSA	PV	SSA	PV	SSA	PV	SSA	PV	SSA	PV
-1.0	556 (5)	633 (7)	598 (169)	682 (248)	598 (6)	682 (7)	677 (193)	772 (283)	677 (9)	772 (10)

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

( ) = Photochemical "reactive" hydrocarbons

SECTION VI

SURFACE COATINGS

This section will discuss the hydrocarbon emissions resulting from the applications of coatings. Surface coating deals exclusively with applying a thin layer of coating on a surface. For purposes of discussion, it has been divided into four categories:

1. Fabric and rubber coatings
2. Protective and decorative coatings such as paints, lacquers, varnishes, etc.
3. Printing inks.
4. Miscellaneous coatings such as adhesives and coatings for paper, leather, film, and glass.

RESULTS OF THE SURVEY

The results of the survey and our best estimates of total usage for the Pioneer Valley are summarized in Table 18. A discussion of each category, including emission estimates and chemical type follows.

Fabric and Rubber Coatings

This section discusses hydrocarbon emissions from establishments engaged in manufacturing coated and impregnated textiles, rubberized fabrics, and other miscellaneous coated products such as insulating tapes and tire manufacturing.

Table 18. HYDROCARBON EMISSIONS FROM INDUSTRIAL SURFACE COATING APPLICATIONS IN THE PIONEER VALLEY

Category	Number of point sources	Total emissions reported (tons/yr)	Estimated total emissions (tons/yr)
Fabric/rubberized	2	906	65
Protective/decorative	22	581	681
Printing	27	2,010	2,240
Miscellaneous	12	8,004	8,670
Totals	63	11,501	12,556

In the survey we attempted to cover all companies with 10 or more employees in SIC 22 and 30, since they classify as companies engaged in textiles and rubber goods manufacturing. Out of 41 questionnaires mailed, 32 responded and seven were out of business. Two firms were found to be emitting in excess of 5 tons per year. Total reported emissions were 906 tons, consisting of mostly acetone and gasoline. Applying the coverage index to account for the nonresponding sources an additional 59 tons were apportioned to the communities by manufacturing employees.

Protective and Decorative Coatings

This section includes the application of paints, lacquers, varnishes, shellacs, primers, and enamels for protective or decorative purposes. This class of coatings is referred to by the industry as "paints" and is classified into two categories, industrial or trade paints. Industrial paints are products that are formulated and sold to other manufacturers (frequently in large containers) for factory application. Trade paints are shelf products that are sold through retail stores to the general public, professional painters, and builders. These products are largely architectural coatings for the outside and inside of new and existing structures. Industrial paints that are applied in large quantities at a fixed location usually become classified as point sources. Nonpoint sources using industrial paints are accounted for in the "Solvents Purchased" entry of the NEDS area source file. Trade-sale paints are by definition exclusively area sources and are discussed in Section X. Industrial paints are used in the manufacturing industries, SIC 24 to 39, and automotive repair shops, SIC 75. Automotive repair shops are almost always area sources.

In the Pioneer Valley, 22 point sources were found to be emitting 555 tons of hydrocarbons. Of these, only three are emitting over 100 tons per year representing 57 percent of total point source emissions. As seen from Table 19, the rest are relatively small sources. An additional 16 companies considered as area sources reported 26 tons. Extrapolation to a 100 percent coverage in each SIC yields a total of 681 tons per year from industrial coatings.

Table 19. CLASSIFICATION OF PROTECTIVE AND DECORATIVE POINT SOURCES FOR THE PIONEER VALLEY

Emission size (tons/yr)	Number of point sources	% of total	Point source emissions (tons/yr)	% of total
1 - 5	5	23	12	2
6 - 10	7	32	49	9
11 - 25	6	27	118	21
26 - 50	0	0	0	0
51 - 100	2	9	157	28
101 - 500	2	9	219	40
Totals	22	100	555	100

Table 20 gives the solvents most commonly used in the region. They are xylol, toluene, alcohol, naphtha, and acetone. This table also shows the results of the survey by SIC category.

Table 20. SURFACE COATING — PROTECTIVE AND DECORATIVE SURVEY RESULTS (TONS)

SIC		Xylol	Toluene	Alcohol	Naptha	Acetone	Other	Emissions reported	% of employee coverage	Scale up emissions	Total emissions
24	Lumber						(1)	0 (1)	67	(1)	0 (2)
25	Furniture						(6)	0 (6)	74	(2)	0 (8)
26	Paper		39	1		46	31	117 (0)	92	(10)	117 (10)
30	Rubber		3				5	8 (0)	94	(1)	8 (1)
32	Stone, clay	(2)						0 (2)	85	(0)	0 (2)
33	Primary metal		1			5	4 (1)	10 (1)	76	(4)	10 (5)
34	Fab. metal products	6	2	4	26		79 (5)	117 (5)	85	(22)	117 (27)
35	Machinery						116 (6)	116 (6)	83	(25)	116 (31)
36	Electrical machinery	35 (2)	9	2			16	62 (2)	82	(14)	62 (16)
38	Instruments		1				6	7 (0)	92	(1)	7 (1)
39	Misc. Mfg.						117 (4)	117 (4)	86	(20)	117 (24)
	Totals	41 (4)	55	7	26	51	374 (23)	554 (27)		(100)	554 (127)

( ) = Area sources.

Printing Inks

The printing industry is another surface coating category that uses solvents. There are five basic types of printing operations: leterpress, flexographic, gravure, lithographic and screen. Whether or not hydrocarbon emissions occur depends on the particular type of ink used for particular methods of application. However, certain types of inks are often used with certain methods. Table 21 indicates the range of percent solvent content in inks for two drying methods versus the five printing processes.[19,20,21]

Table 21. PERCENTAGE OF SOLVENT CONTENT FOR TWO DRYING METHODS VERSUS FIVE PRINTING PROCESSES

Drying Method	Letterpress	Flexographic	Lithographic	Gravure	Screen
Evaporation	-----	Solvent base (40-75%)	-----	(40-75%)	(0-60%)
Heat set	~ 10%	Water base (0-30%)	~ 16%	------	(0-60%)

The flexographic and gravure process account for approximately 65 percent of all solvents used. They mainly use solvent-based inks containing 40 to 75 percent solvent, which is evaporated on drying. Water-base inks are also coming into use in the flexographic process. Some of these water-base inks also contain solvent (0 to 30 percent) for faster drying. The Screen process uses oil and lacquer-type inks which contain 0 to 60 percent solvent. However, this class accounts for less than 6 percent of the national total solvent used for inks. Letterpress and lithographic inks each represent about 15 percent of total solvent emitted from printing operations. Besides solvent emitted from inks other hydrocarbons are also emitted during the printing process, such as alcohol used in water fountains and cleaning solvents used for preparing the presses.

National figures for solvent emitted during 1972 from letterpress, lithographic and gravure printing are shown in Table 22.[22] Figures for

1974 were estimated using the accepted annual growth rate of 7 percent.(18) These figures are based upon lithographic and letterpress inks containing 35 percent solvent and gravure inks containing 65 percent solvent.[16] These totals can be apportioned to the study area based upon the number of printing establishments and manufacturing employees in the area. Based upon this method and allowing a factor for dilution and cleaning estimated emissions in the area are 928 tons from all printing operations.

Table 22. NATIONAL SOLVENT USAGE (TONS/YEAR)[22]

Printing category	1972	1974
Letterpress	15,645	17,912
Lithographic	14,420	16,510
Gravure	107,640	123,237

The results of the survey show that 27 companies were found to be point sources emitting 1968 tons. Table 23 gives a breakdown of the point sources in the Pioneer Valley. Nonpoint sources accounted for 41 tons per year. When emissions are scaled up to account for those not covered by the survey, estimated additional emissions are 230 tons per year. Therefore, total reported and estimated emissions for the study area is 2240 tons in 1974. This figure exceeds the estimated emissions of 928 tons per year based on a national to a regional breakdown and is due mainly to the size and quantity of printers in the Pioneer Valley. Table 24 shows the results of the survey coverage and estimated emissions by SIC. The major types of solvents used by this industry are n-propyl alcohol, isopropyl alcohol, MEK, acetates, naptha and ethyl alcohol.

Table 23. DISTRIBUTION OF PRINTING POINT SOURCES

Emission size (tons/year)	Number of sources	% of total	Point source emissions (tons/year)	% of total
0 - 5	5	19	15	1
6 - 10	6	22	52	3
11 - 25	2	8	27	1
26 - 50	6	21	239	12
51 - 100	4	15	308	16
101 - 500	4	15	1,327	67
Totals	27	100	1,968	100

Miscellaneous Surface Coating

This category includes emissions from coatings not covered by painting, printing and fabric coating. It encompasses treatment of paper, refinishing of leather and any adhesive solvents emitted from operations such as the manufacture of pressure sensitive tapes.

Survey results for the Pioneer Valley show that 12 companies were point sources emitting 8,022 tons of hydrocarbons. Nonpoint sources reported an additional 6 tons/year. After scaling the results of the survey to 100 percent coverage an additional 666 tons was apportioned to cities and towns in the study area based on manufacturing employees.

Table 25 presents the survey coverage and estimated emission for the Pioneer Valley according to SIC. Table 26 classifies the point sources by size. This table demonstrates that three companies in the area are contributing over 90 percent of the total emissions from miscellaneous surface coatings.

Table 24. SURFACE COATING PRINTING SURVEY RESULTS (TONS)

SIC		n-propyl alcohol	IPA	Acetates	MEK	Naptha	Ethyl alcohol	Mineral spirits	Other and unknown	Emissions reported	% of employee coverage	Scale up emissions	Total emissions
24	Lumber				13				17	30 (0)	67	(15)	30 (15)
26	Paper	95	92 (3)	355	21	45	66	7	572 (5)	1253 (8)	92	(110)	1253 (118)
27	Printing	10	33	10	246 (4)	5	76	112 (4)	147 (24)	639 (32)	87	(100)	639 (132)
28	Chemicals		2						30	32 (0)	96	(3)	32 (3)
30	Rubber	1	2	1					8	12 (0)	94	(1)	12 (1)
34	Fabricated metal products							1	2	3 (0)	85	(1)	3 (1)
35	Machinery								(1)	0 (1)	83	(0)	0 (1)
	Totals	106	129 (3)	366	280 (4)	50	142	120 (4)	776 (30)	1969 (41)		(230)	1969 (271)

( ) = Area sources.

Table 25. SURFACE COATING — MISCELLANEOUS
(tons)

SIC		MEK	Acetone	Toluene	Methanol	Ethanol	Acetate	Gasoline	Other	Emissions reported	% of employee coverage	Scale up emissions	Total emissions
24	Lumber								1	1 (0)	67	(1)	1 (1)
26	Paper	159	407	2142	922	539	1294		579 (1)	6042 (1)	92	(528)	6042 (529)
27	Printing	5							53	58 (0)	87	(9)	58 (9)
28	Chemicals								3	3 (0)	96	(0)	3 (0)
30	Rubber		(3)	199				1381		1580 (3)	94	(101)	1580 (104)
31	Leather			22					10	32 (0)	99	(0)	32 (0)
34	Fabricated metal prod.								5	5 (0)	85	(1)	5 (1)
38	Instruments	8	119		139	6			5	277 (0)	92	(24)	277 (24)
39	Misc. mfg.	(2)								0 (2)	86	(1)	0 (3)
	Totals	172 (2)	526 (3)	2363	1061	545	1294	1381	656 (1)	7998 (6)		(666)	7998 (672)

( ) = Area source

Table 26. MISCELLANEOUS POINT SOURCE CLASSIFICATION

Hydrocarbon emissions (tons/yr)	Number of point sources	% of total	Point source emissions (tons/yr)	% of total
0 - 5	3	25	9	.1
6 - 10	—	0	—	0
11 - 25	1	8.3	22	.2
26 - 50	1	8.3	32	.4
51 - 100	1	8.3	58	.7
101 - 250	2	16.8	338	4.2
251 - 500	1	8.3	277	3.5
501 - 1000	—	0	—	0
1001 - 5000	3	25	7286	90.9
Totals	12	100	8022	100

CONTROL EQUIPMENT

There are five control methods that can be used to reduce "reactive" solvent vapor emissions from surface coating application. One is process modification which usually involves a change of solvent. For example, some industries are switching to high solids, powder or water borne coatings. The others make use of one of the four processes below to remove and/or recover the solvent.

- Condensation by cooling or compression
- Absorption
- Vapor incineration
- Adsorption

The concentration of organiz solvent at the point of exit usually ranges from 100 to 200 parts per million. Whenever control equipment is applied as a control measure, the regulation states that the control efficiency should be at least 85 percent. It has been found that, in general, it is only economically feasible to recover or remove solvent vapor emissions for certain processes where substantial recovery can be achieved either by the cost of recovered solvent or by heat recovery.[24]

Condensation and Absorption

Both refrigeration and compression for condensation and absorption are impractical at the concentration range in the air stream from surface coating equipment because of the low temperatures and high pressures required. In general, the economics of these methods are favorable when the concentration is greater than 1 percent which excludes most solvent emitting sources.[24]

Incineration

Solvent emissions may be eliminated by incineration. Usually a maximum temperature of 1500°F and residence times over one-half a second will destroy most organic solvents. Catalytic combustion or oxidation may also be used. The catalytic unit, reduces the preheat temperature of tolerance to 600°F, and reduces fuel costs considerably. For example, the minimum fuel cost for direct flame combustion of solvent vapors at a concentration range of 100 to 200 ppm, was approximately 45 cents per pound of solvent removed. The fuel costs of a catalytic unit would be approximately one-half of that used by the direct flame unit. Installation cost for thermal and catalytic incinerators were found to range from $2 to $5/scfm to a high of $10/scfm. While catalytic incineration is attractive in terms of fuel cost, disadvantages exist when the catalyst life is shortened by poisoning with impurities.[16,24]

While incineration of solvents is highly effective, it may not be economically feasible for certain small or medium solvent emitting processes such as found in printing and "painting." Table 27 presents the fuel costs for paint drying and a lithographic process for thermal incineration with and without heat recovery. The capital and operating costs of thermal and catalytic units on a printing exhaust system are shown in Table 28. The selection clearly depends on the life of the catalyst and the amount of fuel that can be saved.[24]

Adsorption

Activated carbon systems are effective in adsorbing organic material with higher molecular weight than the normal components in air. In general, solvent vapor components are adsorbed in an approximately inverse relationship to their relative volatiles. Removal efficiencies generally approach 100 percent. Fixed bed adsorbers are economically feasible for systems containing more than 0.2 pounds of solvent per 1000 scf of gas (2500 ppm). The economics become more favorable as the cost of the solvent increases. The solvent is recovered by stripping with steam. Recovery operating costs would depend on the type of solvent as shown below:[16,24]

	$/gal
• Solvent immiscible in water	$0.015 to 0.040
• Water miscible solvent	$0.035 to 0.080
• Mixed solvent distillation	$0.050 to 0.100

For package type units capital costs are approximately $4 to $7/scfm. For example, assume a medium sized spray booth spraying 5 gallons of toluene solvent per hour and being exhausted at a rate of 12,000 standard cubic feet per minute (scfm) resulting in an emission concentration of 1 pound of solvent per 20,000 cubic feet of air (700 ppm). Using the

Table 27. FUEL COSTS FOR THERMAL INCINERATION WITH AND WITHOUT HEAT RECOVERY (AVERAGE SYSTEM PAYOUT ONE TO THREE YEARS)[24] [a]

Application	Thermal incineration without heat recovery	Thermal incineration with primary recovery	Thermal incineration with secondary recovery
Paint drying			
Ovens			
Fuel: natural gas at 85 cents/10^6 Btu			
Operation: 3200			
hrs/yr			
Incineration fuel cost	$55,781	$23,588	$23,588
Oven fuel cost	12,218	12,219	(none)
Total fuel cost	$67,999	$35,807	$23,588
Total fuel savings	(none)	$32,192	$44,411
Lithographic process			
Fuel: natural gas at 85 cents/10^6 Btu			
Operations: 5,616 hrs/yr			
Incineration fuel cost	$65,166	$37,046	$35,560
Oven fuel cost	42,641	42,641	29,608
Total fuel cost	$107,807	$79,687	$65,168
Total fuel savings	(none)	$28,120	$77,707

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[a] Fuel cost figures adjusted to 85 cents/10^6 Btu, 8100 SCFM at 320° F.

Table 28. ECONOMIC EVALUATION CATALYTIC UNITS NOS. 1 AND 2 AND THERMAL INCINERATOR (TO DESTROY EQUAL AMOUNTS OF SOLVENT VAPOR FROM PRINTING EXHAUST SYSTEM)[24]

	Catalytic unit no. 1	Catalytic unit no. 2[b]	Thermal incinerator	Thermal incinerator[b]
Acquisition cost	$12,000	$27,400	$19,000	$37,400
Basic unit (approx)				
Process blower cost	800	1,000	800	1,200
Catalyst cost	7,000	7,000	------	------
	$19,800 (FOB)	$35,400 (FOB)	$19,800 (FOB)	$38,600 (FOB)
Capital equipment cost	$12,600	$28,800	$19,800	$38,400
Year one				
Operating temp., °F	850°F	850°F	1,200°F	1,200°F
Fuel cost[a] (natural gas)	$21,000	$11,600	$40,400	$22,500
Catalyst cost[c]	3,500	3,500	------	------
Total	$24,500	$15,100	$40,400	$22,500
Year two				
Operating temp., °F	900°F	900°F	1,200°F	1,200°F
Fuel cost[a] (natural gas)	$23,900	$13,270	$40,400	$22,500
Catalyst cost[c]	3,500	3,500	------	------
Total	$27,400	$16,770	$40,400	$22,500
Total two years	$51,900	$31,870	$80,800	$45,000

[a] Eighty-eight cents/M Btu; 4,000 hrs/year; 7,140 scfm at 320°F.

[b] Includes heat exchanger (44.5 percent effective).

[c] Catalyst replacement at two year intervals.

nomograph of Barneby & Davis and a solvent rate calculated at 0.42, average installed equipment cost would be in excess of $75,000 ($6.2/scfm).[14,16,24] Cost data for three other adsorbers with solvent recovery are presented in Table 29.

Table 29. COST(a) DATA FOR THREE ADSORPTION - SYSTEMS WITH SOLVENT RECOVERY[27]

Adsorber capacity SCFM	1,000	10,000	20,000
Exhaust gas concentration PPM	3,000	3,000	3,000
Installed cost[b]	74,000	162,300	280,000
Operating cost	20,600	64,000	111,500
Operating-cost with recovered solvent	13,200	10,479[c]	37,200[c]

[a] All figures updated to first quarter 1975.

[b] Includes cost for condensation; subcooling, and decantation recovery

[c] Savings

1975, 1977, 1980 and 1985 ESTIMATED EMISSIONS FOR THE PIONEER VALLEY

The resulting emissions from Surface Coating with and without the probable regulations in effect are presented in Table 30. To determine the effect on the industry, the regulations were applied to each individual point source. The photochemical "reactivity" of the material and the type of process were evaluated. Estimated emissions from nonresponding sources were assumed to have the same percent reduction as the responding point sources. For the purposes of estimating the effect of the regulation, it was assumed that any company with more than 5 tons, but less than 100 tons of photochemical reactive solvent would reformulate its solvents rather than purchase control equipment; any company with more than 100 tons of emissions, would purchase control equipment.

Table 30. PROJECTED TOTAL HYDROCARBON AND PHOTOCHEMICAL REACTIVE EMISSIONS FROM SURFACE COATING IN PIONEER VALLEY (TONS)

Category	Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
		SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
Fabric/ Rubberized	2.5	961 (948)	965 (952)	985 (972)	989 (976)	158 (145)	159 (145)	1,034 (1,020)	1,039 (1,025)	166 (152)	167 (153)
Protective/ Decorative	2.5	634 (603)	682 (650)	650 (618)	699 (666)	297 (63)	355 (72)	683 (649)	734 (700)	330 (64)	375 (65)
Printing	2.5	2,155 (367)	2,239 (373)	2,209 (377)	2,295 (383)	1,740 (11)	1,821 (13)	2,321 (395)	2,411 (401)	1,735 (28)	1,819 (31)
Miscellaneous Coating	2.5	7,309 (7,099)	8,694 (8,486)	7,492 (7,153)	8,911 (8,604)	2,161 (1,717)	2,276 (1,874)	7,871 (7,281)	9,362 (8,901)	2,912 (2,313)	3,464 (2,851)

Category	Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
		SSA	PV	SSA	PV	SSA	PV	SSA	PV
Fabric/ Rubberized	2.5	1,114 (1,099)	1,119 (1,104)	180 (166)	181 (166)	1,261 (1,244)	1,266 (1,249)	203 (187)	204 (187)
Protective/ Decorative	2.5	735 (698)	791 (754)	355 (69)	404 (71)	832 (791)	895 (854)	384 (77)	458 (82)
Printing	2.5	2,499 (426)	2,597 (433)	1,867 (30)	1,958 (34)	2,828 (482)	2,938 (490)	2,113 (35)	2,215 (38)
Miscellaneous Coating	2.5	8,476 (7,838)	10,082 (9,700)	3,103 (2,463)	3,691 (3,037)	9,590 (8,866)	11,407 (10,841)	3,509 (2,785)	4,175 (3,435)

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

[c] ( ) = Photochemical "reactive" hydrocarbons

This assumption was based on conversations with several companies in the study area, however, only a more accurate determination can be made by state follow-up.

Emissions in 1974 from fabric coating sources were 952 tons of "reactive" solvent and 13 tons of "nonreactive" solvent. One large company will be required to reduce its emissions by 85 percent. The other point source uncovered by the survey is using a nonreactive solvent and will not be affected by any regulation. Reactive emissions, based on a 2.5 percent growth rate[11] and the effects of the regulation are 145 tons in 1975, 153 tons in 1977, 166 tons in 1980, and 187 tons in 1985.

Protective and decorative coating companies are relatively small emission sources but were numerous. Emissions in 1974 were 650 tons of "reactive" solvent and 32 tons of "nonreactive" solvent. Of the 22 companies determined to be point sources, three firms will not be affected, and the remaining 12 firms will probably reformulate to a "nonreactive" solvent. Based on a 2.5 percent annual growth rate[1] and the regulations, reactive emissions can be reduced by approximately 90 percent in 1975 to 72 tons. Reactive emissions for 1977, 1980, and 1985 are 65 tons, 71 tons and 82 tons, respectively.

Emissions from the printing industry are quite substantial, representing 10 percent of total hydrocarbon emissions in the Pioneer Valley. However, only 17 percent of the industries emissions are reactive. Total emissions from printing are 2239 tons in 1974 and "reactive" emissions are only 373 tons. Sixteen companies will not be affected by the regulation, 10 firms will probably reformulate to a "nonreactive" solvent and one firm will re required to purchase control equipment with at least 85 percent efficiency. This firm will have to reduce its "reactive" as well as "nonreactive emissions because it is exceeding 3000 lb of solvent per day. Based on a 2.5 percent annual growth rate[1] and the regulations, expected "reactive" emissions for 1975, 1977, 1980, and 1985 are 13 tons, 31 tons, 34 tons, and 38 tons, respectively.

Emissions from miscellaneous surface coating accounted for 8486 tons of "reactive" emissions and 208 of "nonreactive" solvent. Four companies will not be affected by the regulation, three firms will probably reformulate and five establishments will be required to purchase control equipment. One of these firms currently has ordered control equipment and will reduce its emissions by approximately 50 percent in 1975 and by approximately 85 percent in 1976. Based on a 2.5 percent annual growth rate[1] and the effects of the regulation, estimated "reactive" emissions will decrease by approximately 80 percent in 1975 to 1874 tons. Estimated "reactive" emissions for 1977, 1980, and 1985 are 2851 tons, 3037 tons and 3435 tons, respectively.

SECTION VII

MANUFACTURING INDUSTRIES

Six companies were determined by GCA to be manufacturing point sources in the Pioneer Valley. These companies were involved in manufacturing paint, golf balls, and specialty chemicals. Emissions from these sources totaled 1713 tons, with an additional 4 tons coming from reported area sources. A breakdown of point sources by size is shown in Table 31.

Table 31. NUMBER AND SIZE OF MANUFACTURING POINT SOURCES IN PIONEER VALLEY

Hydrocarbon emissions (tons/yr)	Number of point sources	% of total	Hydrocarbon emissions (tons/yr)	% of emissions
0 - 5	-	0	-	0
6 - 10	2	33	18	1
11 - 25	-	0	-	-
26 - 100	1	17	36	2
101 - 250	-	0	-	-
251 - 500	1	17	386	23
501 - 1000	2	33	1273	74
Totals	6	100	1713	100

After scaling emissions to 100 percent coverage for SIC's 28 and 39 an additional 143 tons were apportioned to the communities based on manufacturing employees. Survey results and types of emissions are shown in Table 32.

Table 32. SURVEY RESULTS - MANUFACTURING (TONS)

SIC	Toluene	Acetone	Naptha	Other[a]	Emissions reported	% of employee coverage	Scale up emissions	Total emissions
28 Chemicals	7	2	2	1114	1125	96	(47)	1125
				(4)	(4)			(51)
39 Miscellaneous Manufacturing	80	76	423	9	588	86	(96)	588
								(96)
Totals	87	78	425	1123	1713			1713
				(4)	(4)		(143)	(147)

( ) = Area Sources

[a] Some Data Confidential

CONTROLS FOR MANUFACTURING INDUSTRIES

Control techniques for chemical manufacturing depend mostly on the individual type of operation. Systems that are currently available for the control of hydrocarbon emissions are the following: adsorbers, condensers, afterburners, and scrubbers. These systems described in Section VI would reduce "reactive" hydrocarbon emissions to acceptable levels. However, for small chemical manufacturing firms, proper maintenance involving the use of covers, seals, etc., could reduce emissions considerably. Emissions from chemical manufacturing accounts for approximately 8 percent of the total emissions in the Pioneer Valley and for 6 percent of the "reactive" emissions.

PROJECTED EMISSIONS

If regulations are applied to this industry, the two firms involved in paint manufacturing will reformulate. The remaining four firms will have to control their "reactive" emissions by 85 percent. Two plants in particular, because they are exceeding 3,000 lb of hydrocarbon emissions per day will also be required to control nonreactive emissions. Estimated emissions from manufacturing industries in 1975, 1977, 1980, and 1985 are shown in Table 33, with and without control regulations. With the regulations in effect "reactive" emissions from manufacturing will be reduced by approximately 76 percent in 1975, to 268 tons. Emissions in 1977, 1980, and 1985 will be 287 tons, 322 tons and 381 tons, respectively.

Table 33. PROJECTED TOTAL HYDROCARBON AND PHOTOCHEMICAL "REACTIVE" EMISSIONS FROM MANUFACTURING INDUSTRIES IN PIONEER VALLEY (TONS)

Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
	SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
2.5	1,848 (1,120	1,860 (1,127)	1,894 (1,148)	1,907 (1,155)	554 (266)	558 (268)	1,990 (1,206)	2,003 (1,214)	586 (286)	589 (287)

Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
	SSA	PV	SSA	PV	SSA	PV	SSA	PV
2.5	2,143 (1,299)	2,157 (1,307)	642 (319)	647 (322)	2,425 (1,469)	2,440 (1,478)	745 (379)	750 (381)

[a] SSA - Springfield Study Area

[b] PV - Pioneer Valley

( ) - Photochemical "reactive" hydrocarbons

SECTION VIII

BULK STORAGE

This section will discuss the hydrocarbon emissions resulting from the operations of gasoline bulk storage sites, their control and the impact of possible regulations. Such emissions occur from evaporation due to the unloading and loading of storage tanks, tank cars or trucks. The emissions resulting from service station operations are discussed in Section X.

Three bulk storage point sources were determined to be handling gasoline in the study area. Total losses from these sources were 915 tons in 1974. Table 34 gives an emission breakdown by type of operation.

Table 34. GASOLINE EVAPORATION LOSSES AT FIVE BULK SITES IN PIONEER VALLEY[a]

Operation	Gasoline - 1974 (tons)
Tank cars/trucks	
Splash loading	157
Submerged loading	185
Storage/fixed roof	
Breathing	55
Working	518
Total	915

[a] Only one company is in the process of installing control equipment.

Emissions from loading racks accounted for 37 percent of all losses at bulk storage sites with storage tank losses accounting for the remaining 63 percent. The major contributor to emissions at these sites is working losses from fixed roof tanks, representing 56 percent of toal hydrocarbon losses. Emissions from two area sources located at airports in the study area were 7 tons. Emissions from the various operations were calculated using "Compilation of Air Pollutant Emission Factors, AP-42."

One major supplier in the area is currently installing a vapor recovery system for the handling of gasoline and will control emissions by at least 90 percent in 1975. This installation is included in Table 35. Since this one source will be in compliance with state regulations in 1975, no further control will affect this company.

Figure 3 illustrates the 1975 flow of gasoline and emissions resulting from present operating practices. Gasoline entry into the Pioneer Valley is primarily by pipeline and by tank trucks. Retail sales at gasoline service stations were 256.4 x 10^6 gallons. Reported throughput at bulk storage sites for 1974 were 114.2 x 10^6 gallons. (See Table 36). A good assumption is that the remaining 142.2 x 10^6 gallons of gasoline were delivered to the areas of Rhode Island and Connecticut, by tank cars and tank trucks; the major portion coming from Connecticut. Conversations with other bulk distributors in the area confiremd this assumption.[25]

Control Equipment

Controls for petroleum products emissions can be classified under two types: controls for transferring and controls for storing the materials.

Material is transferred into tank trucks, trailers, or tank cars at bulk terminals by means of a loading rack. At the rack, loading is done either by submerged or splash filling. In general, the splash filling emission rate is about three times that of the submerged filling.

Table 35. PROJECTED EMISSIONS FROM GASOLINE BULK STORAGE IN PIONEER VALLEY (TONS)

Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
	SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
0 1974-75 -2.5 1975-85	921 (921)	922 (922)	132 (132)	133 (133)	92 (92)	92 (92)	125 (125)	126 (126)	88 (88)	88 (88)

Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
	SSA	PV	SSA	PV	SSA	PV	SSA	PV
0 1974-75 -2.5 1975-85	115 (115)	116 (116)	81 (81)	81 (81)	103 (103)	104 (104)	72 (72)	72 (72)

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

( ) = Photochemical "reactive" hydrocarbons

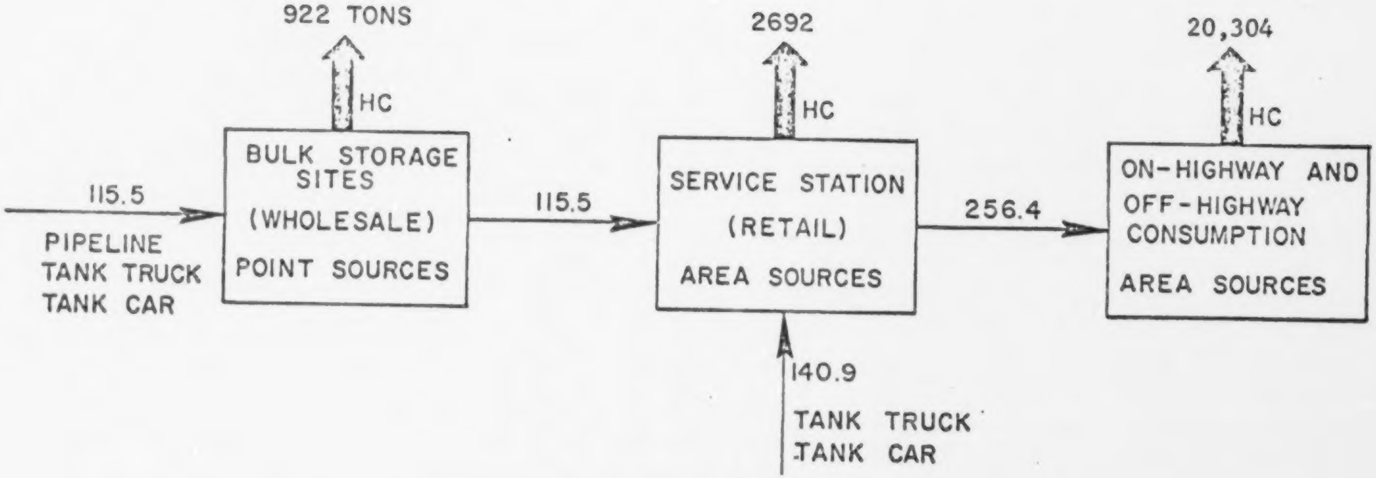
922 TONS
HC
2692
HC
20,304
HC
115.5
PIPELINE
TANK TRUCK
TANK CAR
BULK STORAGE SITES
(WHOLESALE)
POINT SOURCES
115.5
SERVICE STATION
(RETAIL)
AREA SOURCES
256.4
ON-HIGHWAY AND OFF-HIGHWAY CONSUMPTION
AREA SOURCES
140.9
TANK TRUCK
TANK CAR

Figure 3. Gasoline flow (10^6 millions of gallons) and resulting hydrocarbon (HC) emissions for the Pioneer Valley

Table 36. REPORTED GASOLINE THROUGHPUTS

	Thousand Gallons
Turner Falls Airport	66
Barnes Airport (3 separate operators)	275
F and L Roberts	165
Hampden Oil	973
Mobil Oil	112,740
	114,219

Vapor collection control systems also can be used. All are essentially plug-shaped devices that fit into the hatch opernings and have a central channel through which the recovered liquid can flow back into the compartment.

Petroleum products are stored in essentially six basic types of tank designes: fixed-roof, floating roofs, covered floating roof, internal floating cover, variable space, and pressure. Each of these has a different emission rate. Thus, emission reduction can be achieved by converting from one tank to another; for example, from a fixed roof to a floating roof tank.

Figure 4 and Table 37 provide estimated costs of various gasoline storage tanks. As can be seen, conversion of fixed roofs to floating roofs by installation of internal floaring covers, or installation of new pontoon floating roof tanks, is more economical.

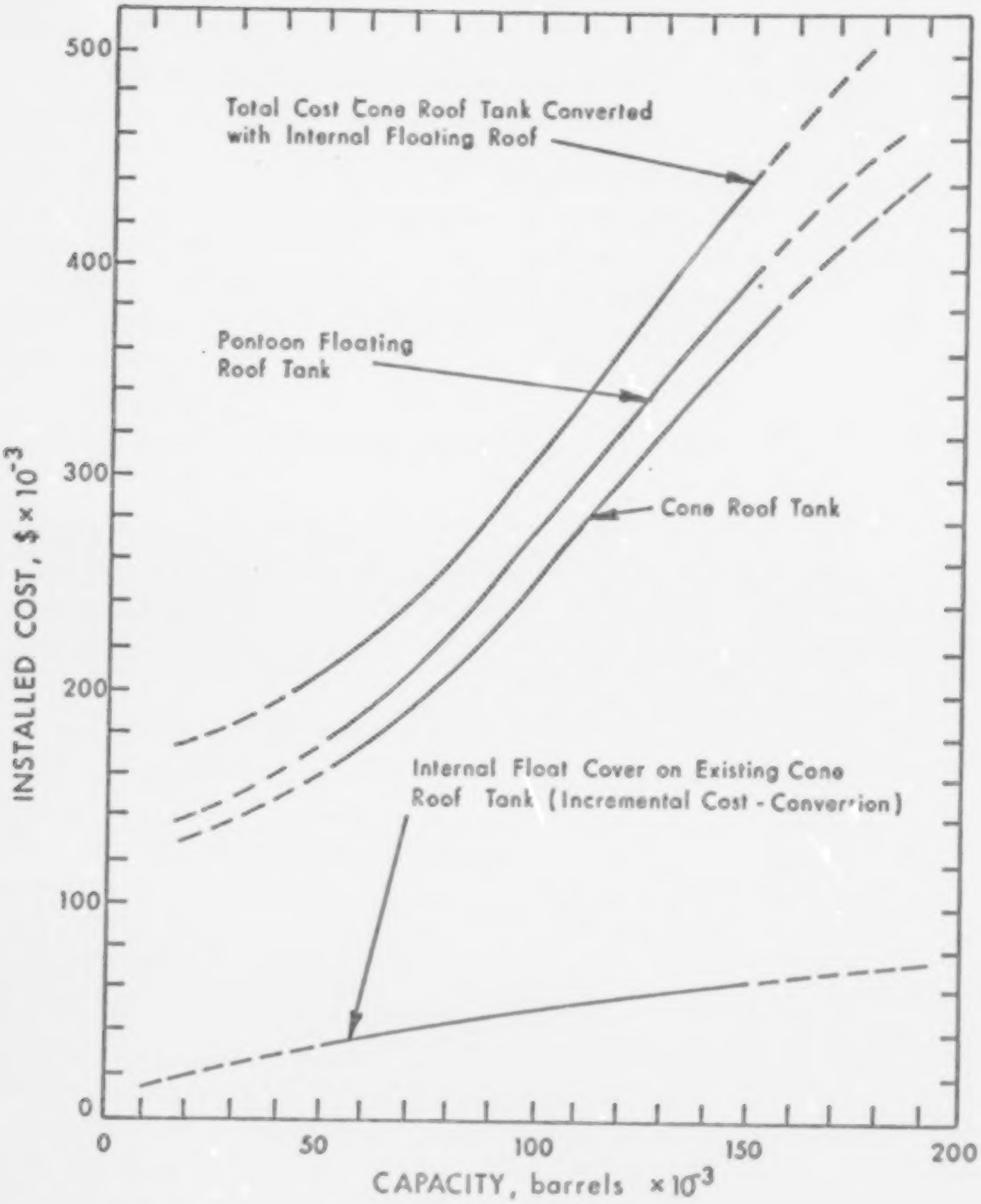

Figure 4. Estimated installed cost of gasoline storage tanks[27]

Table 37. ESTIMATED INSTALLED COSTS OF GASOLINE STORAGE TANKS[27]

Nominal tank capacity	50,000 barrels	100,000 barrels	150,000 barrels
Size	90' dia x 48'	120' dia x 48'	150' dia x 48'
Installed costs			
Fixed roof tank	$161,000	$257,000	$379,000
Pontoon floating roof tank	$176,000	$279,000	$403,000
Internal floating cover in existing roof tank	$34,000	$54,000	$68,000

PROJECTED HYDROCARBON EMISSIONS FROM GASOLINE BULK STORAGE

The resulting emissions from gasoline bulk storage for 1975, 1977, 1980 and 1985 are presented in Table 36 with and without probable regulations. Because one major company in the area is already installing control equipment with 90 percent efficiency, there will be very little further reduction of emissions if regulations are applied to this industry. Without regulations in 1975, emissions will be reduced by 86 percent. With regulations in 1975, emissions will be reduced by 90 percent. As can be seen by this table, emissions will slowly reduce to 72 tons per year by 1985. This decrease is a result of an assumed decrease in the use of gasoline due to conservation and the development of a more efficient automobile. The generation of this table was based upon the assumption that there will be no change in the amount of gasoline consumed between 1974 and 1975 and that there will be a 2.5 percent annual decrease in consumption between 1975 and 1985.[3]

The type of emissions from gasoline storage tanks are C_4 through C_6 paraffins, C_4 and C_5 olefins, and small quantities of propane. These compounds, with the exception of propane are believed to be photochemically "reactive."[28] All emissions have been so classified as reactive. Emissions from gasoline marketing are presented in Section X - Exclusively Hydrocarbon Area Sources.

SECTION IX

FUEL COMBUSTION AND SOLID WASTE

Point and area source information for fuel combustion and solid waste incineration was gathered either from the partly revised 1972 NEDS emission inventory or from additional information found in the literature or supplied by the state air pollution control agency. Area source emissions were apportioned to communities according to procedures found in APTD-1135.

Point source emissions from combustion of all types of fuels totaled 299 tons per year. Area source emissions were 552 tons per year calculated from fuel usage supplied by the state agency. Emissions from incinerators were 11 tons from point sources and 210 tons from area sources.

PROJECTED EMISSIONS

Emissions were projected for the years 1975, 1977, 1980 and 1985 and are presented in Table 38. These projections were based on anticipated growth rates as the nation adopts specific energy saving technologies. The growth rate for combustion is expected to be 1.9 percent annually and for incineration it is expected to be 0.7 percent annually.[4] These hydrocarbon emissions are considered photochemically "reactive."

Table 38. PROJECTED HYDROCARBON EMISSIONS FROM FUEL COMBUSTION AND INCINERATION IN PIONEER VALLEY (TONS)

Category	Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
		SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
Fuel Combustion	1.9	782 (782)	851 (851)	797 (797)	867 (867)	797 (797)	867 (867)	827 (827)	900 (900)	827 (827)	900 (900)
Incineration	0.7	298 (298)	321 (321)	300 (300)	323 (323)	300 (300)	323 (323)	304 (304)	328 (328)	304 (304)	328 (328)

Category	Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
		SSA	PV	SSA	PV	SSA	PV	SSA	PV
Fuel Combustion	1.9	876 (876)	953 (953)	876 (876)	953 (953)	962 (962)	1,047 (1,047)	962 (962)	1,047 (1,047)
Incineration	0.7	311 (311)	335 (335)	311 (311)	335 (335)	322 (322)	347 (347)	322 (322)	347 (347)

[a] SSA - Springfield Study Area

[b] PV - Pioneer Valley

( ) - Photochemical "reactive" hydrocarbons

SECTION X

EXCLUSIVELY HYDROCARBON AREA SOURCES

This category consists of evaporation from application of trade paints, evaporation from gasoline marketing, combustion of fuels in transportation, nonhighway use of motor fuels, and miscellaneous combustion sources. Area sources from stationary fuel combustion and solid waste disposal have already been discussed in Section IX. Emissions from these and all combustion related processes, are considered photochemically "reactive."

EVAPORATION FROM THE APPLICATION OF TRADE PAINTS

Emissions in the Pioneer Valley from the application of trade paints were 2547 tons per year in 1974.[22] Approximately 30 percent is considered to be "reactive" emissions. These emissions were apportioned to the communities by population. It is expected that emissions from this category will increase at approximately 2.5 percent per year.[1] Projected emissions for 1975, 1977, 1980 and 1985 are shown in Table 39. Controls for trade paints are not intended for every individual applying paint but would be an indirect effect as a result of controlling the type of solvent that the manufacturer would be allowed to use.

EVAPORATION FROM GASOLINE MARKETING

Gasoline is the only petroleum product which is emitted in significant quantities through retail marketing. About 256 million gallons of gasoline were sold at 507 service stations in the Pioneer Valley. The quantity of

Table 39. PROJECTED EMISSIONS FROM TRADE PAINTS, GASOLINE MARKETING, AIRCRAFT, RAILROADS AND VESSELS (TONS)

Category	Annual Growth (%)	1974		1975 No control		1975 With control		1977 No control		1977 With control	
		SSA[a]	PV[b]	SSA	PV	SSA	PV	SSA	PV	SSA	PV
Trade Paints	2.5	2,222 (667)	2,547 (764)	2,278 (683)	2,611 (783)	2,278 (23)	2,611 (26)	2,393 (718)	2,743 (823)	2,393 (72)	2,743 (82)
Gasoline Marketing	0 1974-75 -2.5 1975-85	2,273 (2,273)	2,692 (2,692)	2,273 (2,273)	2,692 (2,692)	227 (227)	269 (269)	2,161 (2,161)	2,559 (2,559)	216 (216)	256 (256)
Aircraft	6.0	48 (48)	52 (52)	51 (51)	55 (55)	51 (51)	55 (55)	57 (57)	62 (62)	57 (57)	62 (62)
Railroads/ Vessels	3.5	188 (188)	422 (422)	195 (195)	437 (437)	195 (195)	437 (437)	208 (208)	468 (468)	208 (208)	468 (468)

Category	Annual Growth (%)	1980 No control		1980 With control		1985 No control		1985 With control	
		SSA	PV	SSA	PV	SSA	PV	SSA	PV
Trade Paints	2.5	2,577 (773)	2,954 (886)	2,577 (77)	2,954 (89)	2,915 (875)	3,342 (1,003)	2,915 (88)	3,342 (100)
Gasoline Marketing	0 1974-75 -2.5 1975-85	2,003 (2,003)	2,372 (2,372)	200 (200)	237 (237)	1,765. (1,765)	2,090 (2,090)	177 (177)	209 (209)
Aircraft	6.0	68 (68)	74 (74)	68 (68)	74 (74)	91 (91)	99 (99)	(91) (91)	(99) (99)
Railroads/ Vessels	3.5	231 (231)	519 (519)	231 (231)	519 (519)	274 (274)	616 (616)	274 (274)	616 (616)

[a] SSA = Springfield Study Area

[b] PV = Pioneer Valley

( ) = Photochemical "reactive" hydrocarbons

on-highway motor vehicle and off-highway gasoline consumption for 1974 has been estimated using state sales figures.[29]

Evaporative emissions were calculated using an overall emission factor which is the summation of emission factors from five gas station operations.[12] Emission factors were adjusted for an average gasoline vapor pressure. The operations and emission factors at 4.6 psia vapor pressure are given in Table 40. Resulting emissions, which were apportioned to the communities by number of service stations, are 2692 tons per year.

Table 40. EMISSIONS AND LOSSES PER 1000 GALLONS TRANSFERRED[12]

Operation	Pounds/1000 gals transferred
Tank truck unloading	1.6
Storage tank splash fill	9.2
Storage tank unloading	0.8
Vehicle fill	8.8
Gasoline spillage	0.6
Total	21.0

Emissions are projected for 1975, 1977, 1980 and 1985 using a zero percent growth between 1974 and 1975 and a 2.5 percent annual decrease between 1975 and 1985[3] (See Table 39). If a regulation similar to the Boston Interstate Region is to be applied, significant reductions must be achieved.

To achieve a 90-percent reduction in HC emissions from gasoline stations requires controls at gasoline service stations. This in turn requires vapor recovery during tank truck loading at bulk plants and terminals. The most feasible approach is as follows:[16]

Phase I (55 percent control)

1. Modify tank trucks and install the necessary equipment at service stations to recycle the vapors displaced from the underground storage tanks back to the tank trucks during gasoline delivery.

2. Install vapor recovery systems to collect and recover the vapors collected at the service station, as they are displaced from the tank truck during reloading at bulk plants and terminals.

Phase II (35 percent control)

1. Install special gasoline dispensing nozzles, hoses and vapor return lines on the gasoline pumps at the service stations to collect and return vapors displaced from the automobile fuel tank during refueling, to the underground storage tanks at the service station. Accounts for 25 percent of the 35 percent total.

2. Install vapor recovery equipment on the underground storage tanks at the service station if necessary, to achieve an overall reduction in emissions of 90 percent at the service station. Will achieve remaining 10 percent of the 35 percent total.

Equipment costs to achieve Phase I (recycle vapors back to tank trucks and to recover vapors at bulk terminals) will cost approximately $2000 per service station and will reduce emissions by 55 percent. The cost to achieve an additional 25 percent control from Phase II Part 1 (special nozzles and return vapor lines) is approximately $6000. If it is necessary to achieve the additional 10 percent control to give an overall control of 90 percent regenerative carbon canisters or refrigeration-condensation units will be required at an additional cost of approximately $8000.[31]

TRANSPORTATION EMISSIONS

In most areas this category is the largest source of hydrocarbon emissions. Emissions are from all transportation classes: motor vehicles, aircraft, railroads and vessels. The emissions from motor vehicles are by far the largest. The methodology and emission estimates for motor vehicles will be presented in the transportation control plan being developed for the Pioneer Valley, also under this EPA task order (see Volume I). Other emissions from aircraft LTO's, railroads and vessels are shown in Table 39, and annual growth rates are expected to be 6.0 percent, 3.5 percent and 3.5 percent, respectively.[7]

SECTION XI

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APPENDIX A

BOSTON, MASSACHUSETTS; PROMULGATION OF TRANSPORTATION CONTROL PLAN

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■

NATIONAL AMBIENT AIR QUALITY STANDARDS

State Transportation Control Plans

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER C—AIR PROGRAMS

PART 52—APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS

Boston, Massachusetts; Promulgation of Transportation Control Plan

On March 20, 1973, by publication in the FEDERAL REGISTER (38 FR 7237), the Administrator notified the Governor of Massachusetts that a control plan must be submitted by April 15, 1973, for the Metropolitan Boston Intrastate Air Quality Control Region (hereinafter referred to as the "Boston Intrastate Region").

No plan was submitted and the Administrator proposed a transportation control plan for the Boston Intrastate Region on July 2, 1973, by publication in the FEDERAL REGISTER (38 FR 17689). Hearings were held on July 19 and 20, 1973, at Faneuil Hall in Boston and a period for written comments was provided.

AIR POLLUTION IN BOSTON INTRASTATE REGION

The Boston Metropolitan area lies on Massachusetts Bay in relatively flat coastal terrain. Topography does not generally influence pollutant dispersal adversely, but meteorological influences, specifically the proximity of the ocean and the resultant sea breezes, have a minor but adverse influence on photochemical oxidant levels. Although the region is served by rail, rapid transit, and extensive bus service, automobile use is heavy, particularly in outlying manufacturing areas. The urban core, though handling fewer vehicles than some urban areas, is still subject to considerable traffic density and congestion, which are commonly attributed to the narrow antiquated streets and resulting traffic patterns. The control strategies herein are directed at reducing emissions within the Boston Intrastate Region.

The primary national ambient air quality standard for photochemical oxidants is 160μg/m³ [0.08 parts per million (ppm)] average for a 1-hour period, not to be exceeded more than once per year. This standard was exceeded in numerous occasions in 1971. During 1972, this standard was exceeded on 43 days out of 62 days during a 2-month monitoring study. The maximum 1-hour reading for oxidants was 0.260 ppm; the second highest was 0.253 ppm. There were six monitoring sites for oxidants in the Boston Intrastate Region.

Based on the second highest value of 0.253 ppm, the linear rollback model indicates a 60-percent reduction of hydrocarbon emissions from 1972 is required in the Boston Intrastate Region in order to attain the national primary standard for photochemical oxidants. The base year (1972) emissions of 307,100 kg/day of hydrocarbons must be reduced to 97,000 kg/day in order to attain the photochemical oxidant standard. Although if emissions would increase due to growth, if there were no controls, the Federal Motor Vehicle Pollution Control Program (FVPCP) will reduce the hydrocarbon emissions to 232,700 kg/day by 1975.

The primary national ambient air quality standards for carbon monoxide (CO) are 35 ppm average for 1 hour and 9 ppm for 8 hours, each to be exceeded no more than once per year.

In the Boston Intrastate Region, the 8-hour CO standard is exceeded frequently; in 1970 it was exceeded on 56 days. The maximum 8-hour average recorded was 22.0 ppm, and the second highest was 21.9 ppm, both occurring during 1970. There were five carbon monoxide monitoring sites in the Boston Intrastate Region.

Based on the second highest value of 21.9 ppm, the linear rollback model indicates a 59 percent reduction of carbon monoxide emissions from 1970 is required in the Boston core area to attain the national primary carbon monoxide 8-hour standard. The baseline (1970) carbon monoxide emission of 107,440 kg/day must be reduced to 44,750 kg/day in order to attain the carbon monoxide 8-hour ambient air quality standard. Although emissions would increase due to growth, if there were no controls, the ongoing FMVCP will reduce carbon monoxide emissions to 72,490 kg/day by 1975. In order to attain the standards, it will be necessary to reduce projected total emissions of hydrocarbons within the Boston Intrastate Region by an additional 135,700 kg/day (approximately 58 percent) and to reduce projected emissions of carbon monoxide in the Boston core and East Boston areas of the Region by an additional 27,740 kg/day (approximately 40 percent). Table 1 summarizes the required reduction in quantitative terms.

TABLE 1.—SUMMARY OF EMISSION PROJECTIONS [Kilograms per day]

	Hydrocarbons, Route 128 area	Carbon monoxide	
		Boston core	East Boston
Base year emissions (CO-1970, HC-1972).	307,100	99,820	7,620
May 31, 1975, with existing regulations.	232,700	66,350	6,140
Allowable emissions	97,000	41,020	3,730
Necessary reductions from May 31, 1975, projection	135,700	25,330	2,410
Percent	58.0	38.2	39.3

EPA TRANSPORTATION CONTROL PLAN

SUMMARY

The five strategies that follow have been chosen, insofar as possible, to be consistent with the expressed policies and preferences of the Governor of the Commonwealth, the City of Boston and the public comments received through the public hearing process.

(1) *Emission control alternatives.* The emissions of carbon monoxide in the Boston Intrastate Region come almost entirely from motor vehicle sources, so that the reductions required beyond those provided by the Federal Motor Vehicle Pollution Control Program will need to be effected by transportation controls that reduce total motor vehicle emissions. In the case of hydrocarbon emissions in the Boston Intrastate Region, however, over half come from nonvehicular sources, so that an alternative exists for effecting some of the required reductions by further controlling these emissions. This possibility has been utilized, and the regulations here proposed for the Boston Intrastate Region are designed to reduce hydrocarbon emissions from stationary sources to the maximum degree considered feasible. Considerable further reductions will be required, however, and these will have to be effected by transportation controls directed at motor vehicle emissions.

(2) *Transportation control alternatives.* There are two general types of transportation controls available, those that effect emission reductions by reducing the average emissions from a vehicle-mile of travel (VMT), and those that effect reductions by reducing VMT, that is by reducing the total amount of vehicle usage. It is the expressed policy of the Governor of Massachusetts to discourage continued heavy reliance on the automobile for urban core travel by encouraging increased transit usage and by other means. The public through the hearings has also expressed a desire to avoid the use of the most costly of the vehicle emission reduction controls.

Consequently, in promulgating the following mixture of the two types, the Administrator has selected insofar as possible those VMT-reducing controls that can have their impact within the time frame of the May 31, 1975 target date. In order to lay a firm foundation for the Commonwealth's on-going program to maintain the standards, and in order to hold to a minimum the need for vehicle-emission controls for the general population of vehicles in the Boston Intrastate Region.

(3) *Controls for stationary hydrocarbon sources.* Controls to prevent hydrocarbon emissions will be placed on a variety of stationary sources. In addition to the control of emissions from the bulk storage of gasoline that will be required under existing state regulations, the regulations proposed herein will require the extensive control of evaporative losses from retail gasoline sales outlets and all significant users of organic solvents. In addition, paints used for architectural coatings will have to be either formulated with nonreactive hydrocarbon solvents or water based. These regulations will reduce the expected 1975 total of stationary source hydrocarbon emissions from 130,600 kilograms per day (kg/day) to 50,500 kg/day, a reduction of 80,100 kg/day. This amount is about 59 percent of the 135,700 kg/day total hydrocarbon reduction required, leaving a balance of 55,600 kg/day to be achieved by reducing vehicular emissions.

The proposed stationary source controls published in the July 2, 1973, FEDERAL REGISTER (38 FR 17695) have been revised so that controls of nonphotochemically reactive hydrocarbon emissions from organic solvent users are no longer required. In addition exemptions for various high solids and high water content solvents are also provided for in the final regulations.

(4) *Reductions in VMT*. The carbon monoxide emission reduction strategy provides some different controls in the Boston core area and East Boston. The primary reason this approach is taken is because the overwhelming majority of the vehicle miles of travel in East Boston is generated by a single source: Logan International Airport. Consequently, transportation control strategies aimed at reducing VMT generated by Logan Airport are necessary for attaining the carbon monoxide standard in that portion of Boston. Secondly, it was originally assumed that controls applied only to the Boston core area would be sufficient to effect the necessary reductions in East Boston. That assumption was later determined erroneous. However, as shown on the tables below the transportation control strategies applied to each of the two zones will effect some reductions of carbon monoxide emissions in the other zone.

The proposed regulations will impose controls on commuter parking in the Boston Intrastate Region, including the banning of on-street parking in the freeze area from 7 a.m. to 10 a.m. on weekdays, and the imposition of a 25¢/hour surcharge on off-street parking applicable from 7 a.m. to 7 p.m. in the Boston core area and at Logan International Airport. In addition all off-street parking facilities within the Boston core area shall be required to reduce the number of available parking spaces by a certain percentage so as to require a 40 percent vacancy rate in off-street commercial parking facility until 10 a.m. on weekdays. The implementation of the on-street parking ban shall be phased in commencing on June 30, 1974, with final compliance prior to March 1, 1975. The surcharge shall be effective prior to May 31, 1975. The reduction in available parking spaces shall be accomplished prior to March 1, 1975.

It has been noted that parking restrictions at Logan Airport will very likely generate an increase in pick-up and drop-off trips unless special measures are taken to avoid this result. Consequently, there shall be an egress toll by May 31, 1975, applicable to certain vehicles leaving Logan Airport. The toll shall be $1 from 10 a.m. to 4 p.m.; and $2 from 7 a.m. to 10 a.m. and 4 p.m. to 7 p.m. weekdays. The following vehicles shall be exempt from the egress toll: buses, airport limousines, trucks, emergency vehicles, taxi cabs with two or more passengers, employees of Logan Airport, and other private vehicles showing proof of parking for a minimum of four consecutive hours in one of the airport commercial garages.

There shall be a freeze effective on October 15, 1973, on the number of employee parking spaces in the core and spaces in off-street commercial facilities in a freeze area encompassing the Boston core area, Logan Airport, Cambridge, and parts of Somerville. In addition the on-street parking ban is applicable in the freeze area.

Because the carbon monoxide problem is concentrated in two relatively small areas—Logan Airport and the Boston core area—VMT reducing controls that are directed at limiting traffic in these areas are particularly appropriate. Of the various such controls possible, restrictions on commuter parking were selected because similar though less stringent measures have already been considered and recommended by the Governor and by the Boston City Government. The specific hours selected are those that provide the maximum diversion of rush-hour commuters to other transit while causing the minimum inconvenience to shorter-term shopping and other commercial traffic.

In contrast to the situation with carbon monoxide, the photochemical oxidant problem is region-wide, however, and thus it is necessary to devise controls to reduce VMT on a broader basis. This will help reduce both hydrocarbon and carbon monoxide emissions.

The regional parking management regulations provide for limitations on the use of single passenger light-duty vehicles; the restriction consists of requiring a 25 percent reduction in the available employee parking spaces for employers of 50 or more employees in the Region. This requirement shall be complied with prior to May 31, 1975.

A computer carpool matching system, presently in existence through a private concern in the Region, shall be developed by the Commonwealth in the event the existing system is discontinued by the private concern.

In addition, a portion of the Southeast Expressway will be provided exclusively for buses and carpools during 6:30 a.m. to 9:30 a.m. and 3:30 p.m. to 6:30 p.m. on weekdays. The final compliance date for this strategy is May 31, 1975. A portion of Interstate Route 93 shall be utilized totally for buses, trucks, and carpools between the hours of 7 a.m. to 10 a.m. and 4 p.m. to 7 p.m. weekdays.

The Administrator recognizes that in addition to these restraints on vehicle usage there must be adequate alternative transportation available if the controls are, in fact, to have a beneficial effect rather than become a burden The Administrator is not promulgating regulations other than the computer carpool regulation to specifically assure such alternatives because the Commonwealth of Massauchusetts has already assumed initiative for providing improved transit service in the Boston area. However, the Administrator strongly urges the Commonwealth to adopt the following measures in order to alleviate the impact of the promulgated transportation control strategies and to provide adequate means of transportation other than the single occupant motor vehicle so as not to decrease mobility in the Region:

1. The State should undertake the development of additional fringe "park and ride" facilities for use by commuters and air travelers. Among the high priority sites for development are: Riverside, Wonderland, South Quincy, South Braintree, the stub end of I-95 in Canton, and two alternative sites in the Reading/Stoneham area.

2. The Commonwealth and/or the Massachusetts Port Authority, in consultation with local officials should prepare a program for expansion of bus and limousine service and pooled taxi use for trips to and from Logan International Airport. Revenues from the parking surcharge and/or egress toll could appropriately be utilized for the services.

3. The MBTA will shortly make available passes to regular transit users. Employers should be encouraged to establish a payroll deduction plan for the convenience of their employees who wish to purchase MBTA passes.

4. The Commonwealth, in consultation with local officials, should actively pursue the development of a network of bicycle paths within the Region. As a beginning, bicycle storage facilities should be made available at major transit stations within the Boston Intrastate Region.

5. The Commonwealth, in consultation with local officials and owners and operators of parking facilities, should actively pursue the development of a program whereby vehicles containing 3 or more occupants would receive top priority for spaces in public and private parking facilities.

It is also anticipated that the imposition of restraints will prompt a variety of private decisions relative to work hours, carpooling, and similar matters that will operate to ameliorate the adverse impact of the restraints.

The transportation control strategies of the July 2 proposal have been modified to the extent possible in compliance with the public comments (see below) received and further analysis. The $5 surcharge on off-street facilities in the Boston core area has been replaced with a 25¢/hour surcharge applicable from 7 a.m. to 7 p.m. weekdays with the provision that the surcharge shall not exceed $2.50/day. In addition to the surcharge all off-street parking facilities in the Boston core area shall keep vacant 40 percent of the parking spaces until 10 a.m. weekdays. The on-street parking ban is now applicable only between the hours of 7 a.m. to 10 a.m. weekdays, rather than 6 a.m. to 10 a.m. and 4 p.m. to 6 p.m. The $5 surcharge for parking at Logan has been modified to a 25¢/hour surcharge with the same provisions as the Boston core area surcharge. In addition, an egress toll is now applied to certain vehicles leaving Logan on weekdays. In addition, a portion of the Southeast Expressway will be provided exclusively for buses and carpools during 6:30 a.m. to 9:30 a.m. and 3:30 p.m. to 6:30 p.m. on weekdays. Finally, Interstate Route 93 shall be utilized totally for buses, trucks, and carpools between Somerville and the Boston core during 7 a.m. to 10 a.m. and 4 p.m. to 7 p.m.

The vehicle prohibition strategy has been replaced with the regional parking management program whereby em-

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ployers of 50 or more employees shall reduce their available employee parking by 25 percent.

(5) *Proposed tailpipe controls on mobile source emissions.* In addition to VMT reductions, the following "tailpipe" controls are being promulgated. All light-duty and medium-duty gasoline-powered vehicles will be required to be inspected semiannually using a loaded-mode emission test, a relatively inexpensive testing procedure. Vehicle owners will be required to obtain any maintenance necessary to ensure that all pollution control devices on the vehicle work properly and that the vehicle operates at low pollution levels.

The installation of air bleed emission controls will be required on all 1968-1971 model year light-duty gasoline-powered vehicles and all pre-1972 medium-duty vehicles. The installation of vacuum spark advance disconnect will be required on all pre-1968 model year, light-duty, gasoline-powered vehicles. A further requirement will be the installation of an oxidizing catalyst on all gasoline-powered light-duty vehicles in fleets of 10 or more vehicles; on all 1969-1974 model year, medium-duty, gasoline-powered vehicles; and on 1974 private light-duty, gasoline-powered vehicles.

Although the oxidizing catalyst is believed to be technologically feasible by 1975, the Administrator recognizes that it is not possible to implement this control measure in the Boston Intrastate Region by that date. Consequently, the Administrator is granting an extension of 2 years for the implementation of catalytic retrofit control devices. For the same reason, the Administrator is granting extensions of 7 months, 14 months, and 14 months, respectively, for implementation of the vacuum spark advance disconnect, air bleed emission control devices, and the loaded-mode inspection and maintenance program.

The "tailpipe" strategies of the July 2 proposal have been modified as a result of public comments and further analysis. The idle mode annual inspection and maintenance program has been replaced by a loaded-mode semiannual inspection and maintenance program. The vacuum spark advance disconnect has been modified to apply to pre-1968 vehicles rather than pre-1971. An air bleed emission control device is required on all 1968-1971 vehicles. Finally, certain medium-duty, gasoline-powered vehicles are not subject to the inspection and maintenance program, air bleed, and catalytic retrofit emission control devices.

FINDINGS

In the development of the transportation control plan for the Boston Intrastate Region, the Administrator first determined all of the VMT reduction strategies that are applicable within the Region. The Administrator is promulgating all of the applicable VMT reduction strategies except two: gasoline supply limitation and the vehicle use prohibition program (sticker system). Based on comments received through the public hearing process, and further analysis, the Administrator determined that a vehicle use prohibition program is not an available or practicable strategy. The regional parking management program has been substituted for that strategy. As for limiting the supply of gasoline to the Region, the Administrator also determined that this strategy was neither available nor practicable prior to 1977, and the degree to which VMT will be reduced by other measures is the maximum practicable degree. After selection of all applicable VMT reduction strategies, the Administrator acquired the remaining reductions through application of the available and practicable "tailpipe" controls.

Other potential VMT reducing measures such as restricting the flow of traffic to such points as the Mystic River Bridge, harbor tunnels, and toll gates on the Massachusetts turnpike; restricting the downtown on and off ramps of the Central Artery, Southeast Expressway, and Route 1 for use exclusively by buses and carpools only during commuting hours; a ramp metering system for preferential access given to buses and carpools; and a north/south bus lane system through the Boston core area will be thoroughly studied by the Commonwealth to determine the feasibility of implementing these strategies within the Boston Intrastate Region.

Although all of the transportation control strategies selected by the Administrator for attaining and maintaining the carbon monoxide and photochemical oxidant standards by May 31, 1975, are technologically feasible, several are not implementable in the Boston Intrastate Region by that date. Consequently the Administrator is granting extensions under 110(e) of the Clean Air Act for full compliance according to the following schedule:

1. Vacuum spark advance disconnect—January 1, 1976.
2. Air bleed emission control device—August 1, 1976.
3. Catalytic retrofit devices—May 31, 1977.
4. Inspection and maintenance—August 1, 1976.
5. Evaporative controls in gas stations, (a) Storage tank delivery—March 1, 1976.
   (b) Vehicle tank filling—May 31, 1977.

The rationale for these extensions are explained in the General Preamble to EPA's transportation control promulgations.

SUMMARY OF EFFECTS OF TRANSPORTATION CONTROLS

Tables 2 through 4 summarize the effects of each of the proposed controls on emissions in the three areas in which reductions are required. The May 31, 1975, summary column represents the effects of controls by that date. The May 31, 1977, summary column represents the effects of the proposed control measures after granting the extensions for the implementation of various emission control strategies. Although the reduction of carbon monoxide in 1977 exceeds the quantities required to attain the carbon monoxide standard, this excess reduction is nevertheless needed for attaining the photochemical oxidant standard in 1977.

TABLE 2.—*Summary of effects of controls on hydrocarbon emissions Boston intrastate region*

[Kilograms per day]

	May 31, 1975	May 31, 1977
Nonvehicular emissions without further control	130,600	138,400
Expected reductions:		
Vapor control	−18,830	−17,849
Paint use control		−41,970
Organic solvent control	−23,670	−25,070
Total reductions	−40,500	−84,900
Remaining nonvehicular emissions	90,100	53,500
Motor vehicle emissions without further control	102,100	70,400
Expected reductions:		
Core on-street parking ban; core off-street parking surcharge and space limitation; airport parking restrictions and egress toll	−4,564	−4,594
Regional parking management, computer carpools and preferential lanes	−4,560	−4,074
Inspection-maintenance		−10,070
Air bleed		−3,923
Vacuum spark advance disconnect control		−1,277
Oxidizing catalyst—fleet		−1,050
Oxidizing catalyst—1969-74 MDV and 1974 LDV		−2,611
Total reductions	−9,124	−27,550
Remaining motor vehicle emissions	92,976	42,850
Total emissions without further controls	232,700	208,800
Total reductions	−50,624	−111,874
Total emissions remaining	182,076	96,926
Equivalent to standard	97,000	96,000

TABLE 3.—*Summary of effects of controls East Boston carbon monoxide emissions*

[Kilograms per day]

	May 31, 1975	May 31, 1977
Motor vehicle emissions without further control	6,140	4,760
Expected reductions:		
Core on-street parking ban; core off-street parking surcharge and space limitation	−601	−463
Airport parking restrictions and egress toll	−449	−367
Regional parking management, computer carpools, and preferential lanes	−165	−128
Inspection maintenance		−641
Air bleed		−673
Vacuum spark advance disconnect control		−23
Oxidizing catalyst—fleet		−106
Oxidizing catalyst—LDV		−250
Total reductions	−1,215	−2,657
Total emissions without further controls	6,140	4,760
Total reductions	−1,215	−2,657
Emissions remaining	4,925	2,103
Equivalent to standard	3,730	3,730

TABLE 6—*Summary of effects of controls Boston core carbon monoxide emissions*

[Kilograms/day]

	May 31, 1975	May 31, 1977
Motor vehicle emissions without further control	66,350	49,870
Expected reduction:		
Core on-street parking ban; core off-street parking surcharge and space limitation; airport parking restrictions and egress toll	−3,336	−2,542
Regional parking management, computer carpools and preferential lanes	−3,333	−2,541
Inspection-maintenance		−7,272
Air bleed		−7,116
Vacuum spark advance disconnect control		−215
Oxidizing catalyst—fleet		−1,101
Oxidizing catalyst—LDV		−1,589
Total reductions	−6,669	−22,694
Total emissions without further controls	66,350	49,870
Total reductions	−6,669	−22,694
Total emissions remaining	59,681	27,176
Equivalent to standard	41,020	41,020

BASIS FOR EMISSION REDUCTION

Additional technical information is contained in the "Technical Support Document of the Transportation Control Strategy for the Metropolitan Boston Intrastate Air Quality Control Region." This document is available from the Environmental Protection Agency, Region I Office, Room 2203, John F. Kennedy Federal Building, Boston, Massachusetts 02203.

ECONOMIC AND SOCIAL IMPACT OF TRANSPORTATION CONTROL PLAN

Congress recognized that achievement of the goals of the Clean Air Act would have a significant impact on many urban areas.

Because it is not possible to effect sufficient reductions to meet the standards by VMT controls alone, all the possible combinations of controls that were considered included an inspection and maintenance program and the use of additional emission control equipment on existing vehicles. The combination proposed requires the least possible expenditure by the individual light-duty vehicle owner. The probable annual cost of the required inspection should be about $5, with an additional $15 to $25 cost required if maintenance is needed: the maintenance is of course desirable on its own merit, and thus is not viewed as a serious burden. The vacuum spark advance disconnect devices are also inexpensive, about $20 to $25 per vehicle, installed. The air bleed device will cost approximately $40 per vehicle, installed.

The oxidizing catalyst requirements are somewhat more expensive about $90–$140 per vehicle installed under a State-supervised system. This is of particular concern with respect to the provision of catalysts on older light-duty vehicles. Thus requirement for catalyst controls for the Intrastate Region is placed on newer rather than older vehicles, since the cost is smaller in comparison with the greater value of the new vehicle. If the catalyst cost falls directly on the individual light-duty vehicle owner, however, the specific burden will weigh more heavily on the low-income families. Consequently, it is suggested that the Commonwealth consider subsidizing these costs, perhaps through a bond issue retired from an additional gasoline tax.

The transportation control measures will also provide many positive results. In addition to attaining clean air in the Boston Intrastate Region, there will be considerable reduction in traffic congestion and noise in the Boston core area. With the implementation of the regional parking management, affected persons will be saving between $250 to $500 per year. The mandatory inspection and maintenance program will require vehicles that are incorrectly tuned to be corrected, therefore eradicating unnecessary fuel losses.

Finally, mass transit facilities throughout the Boston Intrastate Region will be expedited by the additional funding provided by the surcharge revenues to accommodate the extra demand generated by the transportation control plan. This plan will significantly improve public health and it will serve to promote the long-term environmental and transportation goals of the Boston Intrastate Region, as well as resulting in fuel conservation.

Any direct or indirect effects of the plan on the economy of the area are primarily dependent on the extent of the reduction in VMT required. It is expected that the principal effects will be more a matter of social adjustment than of serious economic consequences although the impact cannot be better defined until the social economic impact study has been performed. However, the degree of the impact will depend upon the extent to which adequate mass transit is provided.

PUBLIC COMMENTS RECEIVED

The Administrator has developed the plan to be as responsive as possible to the needs of the Boston Intrastate Region; he therefore obtained the comments and suggestions of the public on the problems of achieving the ambient air quality standards in the Boston Intrastate Region through the public hearing process.

Comments pertaining to the other measures that may be taken by Federal, State, or local authorities to support or supplement the proposed air pollution control measures were also solicited and received at the hearings. Some comments have already been discussed above. In addition, the following comments were recorded.

The general consensus of the public was that the goal of attaining clean air is valid. However, there was general disagreement on the attainment date of May 31, 1975, and on several of the specific strategies proposed for attaining the standards.

The Governor of the Commonwealth together with the majority of State legislators who testified proposed extending the final compliance date of May 31, 1977 for 1 or 2 years. The business interests testifying at the hearing generally expressed the belief that the original proposal, if implemented, would cause serious economic dislocations in the City of Boston. The remainder of the public commenting at the hearing generally supported the proposal with some reservations on several of the strategies.

The strategies that received the severest criticisms were: the $5 surcharge applicable in the Boston core area and Logan Airport off-street parking facilities; the one day a week vehicular use prohibition strategy (sticker system); and the catalytic retrofit for 1972–1974 private light-duty vehicles.

In addition, comments were received from Massport Authority after the official period for submitting testimony had expired objecting to the parking freeze, egress toll, and surcharge at Logan. Massport contends that no air quality monitoring had been performed at Logan to substantiate that the carbon monoxide ambient air quality standard was exceeded there. Yet air quality monitoring data acquired for a draft environmental impact statement performed for Massport entitled, "Draft Environmental Impact Statement for Extending Runway 4L and 9 and Construction of STOL–GA Runway 15–33" stated on page E–13 that, "For the whole sampling season (186 samples, 1971–1972) 8 percent of the carbon monoxide values on-airport exceeded EPA's primary standard and 6 percent of the off-airport reading exceeded standards." Finally, many comments received called for positive inducements of voluntary actions for attaining emission reductions.

EPA EFFORTS TO MITIGATE THE EFFECTS OF THE REGULATIONS

The combined effects of these regulations, together with the other control strategies in the Massachusetts Implementation Plan, will eliminate the danger to human health that exists in the Boston Intrastate Region as the result of air pollution. The Administrator has made every effort possible to mitigate any adverse economic and social impacts effects of this final promulgation. He will continue contacts with the Department of Transportation and other departments as necessary to ensure the least possible disruption in implementation of these regulations. The Administrator will continue to require that Federal departments and agencies give special attention to the need for funding to provide adequate mass transit to replace reliance on the automobile as the sole means of transportation.

(Secs. 110(c) and 301(a), Clean Air Act (42 U.S.C. 1857c–5(c) and 1857g))

Dated: October 25, 1973.

RUSSELL E. TRAIN,
Administrator.

Part 52 of Chapter I, Title 40, of the Code of Federal Regulations is amended as follows:

Subpart W—Massachusetts

1. Section 52.1122 is amended by adding paragraph (b) as follows:

§ 52.1122 Extensions.

* * * * *

(b) The Administrator hereby extends for 2 years the attainment date for the

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national standards for carbon monoxide and photochemical oxidants in the Metropolitan Boston Intrastate Region and extends for 14 months the attainment date for the national standards for carbon monoxide in Massachusetts' portion of the Hartford-New Haven-Springfield Interstate Region.

§ 52.1127 [Amended]

2. In § 52.1127, the attainment date table is revised by replacing the date "May 31, 1975, f" for attainment of the national standards for carbon monoxide and photochemical oxidants in the Metropolitan Boston Intrastate Region and for carbon monoxide in the Hartford-New Haven-Springfield Interstate Region, with the date "May 31, 1977" for the Metropolitan Boston Intrastate and the date "August 1, 1976" for the Hartford-New Haven-Springfield Interstate Region, and deleting footnote "f".

3. Section 52.1128 is revised to read as follows:

§ 52.1128 Transportation and land use controls.

(a) For purposes of this subpart, the definitions herein are applicable.

(b) Definitions:

(1) "Register", as applied to a motor vehicle, means the licensing of such motor vehicle for general operation on public roads or highways by the appropriate agency of the Federal Government or by the State.

(2) "Boston Intrastate Region" means the Metropolitan Boston Intrastate Air Quality Control Region, as defined in § 81.19 of this part.

(3) "Boston core area" means that portion of the City of Boston, Massachusetts, contained within the following boundaries: The Charles River and Boston Inner Harbor on the northwest, north, and northeast; the Inner Harbor, Fort Point Channel, West Fourth Street, the Inner Harbor to B Street, Fitzgerald Expressway, and the Massachusetts Avenue Expressway access branch on the east and southeast; Southampton Street, Reading Street, Island Street, Chadwick Street, Carlton Street, Albany Street, Hunneman Street, Madison Street, Windsor Street, Cabot Street, Ruggles Street, Parker Street, Ward Street, Huntington Avenue, the Boston-Brookline Municipal boundary, Mountford Street, and the Boston University Bridge on the west. Where a street or roadway forms a boundary, the entire right-of-way of the street is within the Boston core area as here defined.

(4) "Freeze area" means that portion of the Boston Intrastate Region centered within the following boundaries: The B. & M. right-of-way from Fresh Pond to the Charles River Dam and the Boston Inner Harbor on the north and northeast; the Reserved Channel, Dorchester Street to Old Colony Road, through the Old Harbor around Columbia Point to the Southeast Expressway-Morrissay Boulevard intersection on the east, southeast and south; Freeport Street to Hancock Street, Columbia Road, Massachusetts Avenue, Southampton Street, Reading Street, Island Street, Chadwick Street, Carlon Street, Albany Street, Hunneman Street, Madison Street, Windsor Street, Cabot Street, Ruggles Street, Parker Street, Ward Street, Huntington Avenue, Brookline-Boston municipal boundary, Mountford Street, the Boston University Bridge, Memorial Drive, Fresh Pond Parkway, Alewife Brook Parkway to B. & M. rights-of-way on the southwest and west, and Logan International Airport. Where a street or roadway forms a boundary, the entire right-of-way of the street is within the freeze area as here defined.

(5) "Off-street parking facility" means any facility, building structure, lot, or portion thereof used for the temporary storage of motor vehicles.

4. In 38 FR 18876, the regulation titled "§ 52.1129 Legal authority" is amended be revising the title to read "§ 52.1133 Legal authority". The regulation titled "§ 52.1129 Control strategy: Photochemical Oxidants (hydrocarbons) and carbon monoxide", published in 38 FR 16566 remains in effect.

5. Subpart W is amended by adding §§ 52.1134 through 52.1147 and 52.1160 as follows:

§ 52.1134 Regulation limiting on-street parking.

(a) "On-street parking" means stopping a motor vehicle on any street, highway, or roadway (except for legal stops at or before intersections and as caution and safety require) whether or not a person remains in the vehicle, and all such stops when the driver does not remain in the vehicle.

(b) Commencing on or before June 30, 1974, the Commonwealth of Massachusetts and the City of Boston and any political subdivisions or administrative bodies of either having jurisdiction over any streets, highways, or roadways within the freeze area, shall adopt all necessary administrative and enforcement procedures to effect a prohibition of on-street parking within the freeze area between the hours of 7 a.m. and 10 a.m., except Saturdays, Sundays, and legal holidays. The regulation shall state that violation of the prohibition shall be punishable by a fine or not less than $50 and removal of the offending vehicle. The limitation on on-street parking shall be conducted in a phased-in manner to be completed by March 1, 1975. Each such governmental entity shall at a minimum eliminate 33⅓ percent of on-street parking during the hours specified by September 30, 1974; 66⅔ percent by December 31, 1974; and 100 percent by March 1, 1975.

(c) Exceptions to this regulation shall be granted for vehicles owned by residents of the freeze areas that are parked within 0.5 mile of the owner's residence, providing such on-street parking is in compliance with existing parking regulations of the City and Commonwealth. Exemptions of vehicles owned or operated by handicapped persons and disabled veterans (HP and V license plates) may be granted.

(d) On or after June 30, 1974, no owner or operator of a motor vehicle shall park, or permit the on-street parking of, said vehicle within the freeze area except in conformity with the provisions of this section and the measures implementing it.

(e) The Governor of the Commonwealth of Massachusetts, and the chief executive of any other governmental entity on which obligations are imposed by paragraph (b) of this section shall, on or before April 15, 1974, submit to the Administrator for his approval a detailed statement of the legal and administrative steps chosen to effect the prohibition provided for in paragraphs (b) and (d) of this section, and a schedule of implementation consistent with the requirements of this section. Such schedule shall include as a minimum the following:

(1) Designation of one or more agencies responsible for the administration and enforcement of the program.

(2) The procedures by which the designated agency will enforce the prohibition provided for in paragraphs (b) and (d) of this section.

(3) The procedures by which each car will be marked so that residential vehicles will be exempt from the 7 to 10 a.m. ban providing such a vehicle is parked within 0.5 mile of the location specified on the registration of the vehicle.

§ 52.1135 Regulation for management of parking supply.

(a) Definitions:

(1) "Construction" means fabrication, erection, or installation of a parking facility, or any conversion of land, a building or structure, or any portion thereof, to use as a facility.

(2) "Modification" means any change to a parking facility which increases or may increase the motor vehicle capacity of or the motor vehicle activity associated with such parking facility.

(4) "Commence" means to undertake a continuous program of onsite construction or modification.

(5) "Parking facility" (also called "facility") means any lot, garage, building, or structure, or combination or portion thereof, on or in which motor vehicles are temporarily parked.

(6) "Freeze" means to maintain at all times after October 15, 1973, the total quantity of parking spaces available for use at the same amounts as were available for use prior to said date; provided, that such quantity may be increased by spaces the construction of which commenced prior to October 15, 1973; provided, further, that such additional spaces do not result in an increase of more than 10 percent in the total parking spaces available for use on October 15, 1973, in any municipality within the freeze area or at Logan Airport. For purposes of the last clause of the previous sentence, the 10-percent limit shall apply to each municipality and Logan Airport separately.

(7) "Residential parking facility" means a parking facility the use of which is limited exclusively to residents (and

guests) of a residential building or group of buildings under common control and in which no commercial parking is permitted.

(8) "Commercial parking facility" means a parking facility in which parking a motor vehicle is permitted for a fee.

(9) "Parking space/employee ratio" means the ratio of (i) the total number of employee parking spaces provided by an employer at any facility within the Boston Intrastate Region to (ii) the total number of people employed by such employer at such facility.

(10) "Employer" means a person or entity which employs 50 or more persons within the Boston Intrastate Region.

(11) "Action plan" means a plan that contains all the steps to be taken by an employer or the chief executive officer of each municipality in the Boston Intrastate Region to fulfill the requirements of this regulation and the dates by which such steps shall be taken.

(12) "Employee parking space" means any parking space reserved or provided by an employer for the exclusive use of his employees, either with or without charge.

(b) This regulation is applicable in the Boston Intrastate Region.

(c) There is hereby established a freeze, as defined by paragraph (a)(6) of this section, on the availability of parking spaces in the freeze area effective October 15, 1973. In the event construction commenced prior to October 15, 1973 exceeds the 10-percent limit prescribed by paragraph (a)(6) of this section in any municipality or at Logan Airport, then the Commonwealth of Massachusetts shall immediately take all necessary steps to assure that the available spaces within such municipality or at Logan Airport shall be reduced to comply with the freeze. The freeze shall apply with the following exceptions:

(1) Residential parking facilities shall be exempt from the freeze.

(2) Free customer parking shall be exempt from the freeze providing the parking facility is not utilized as a commercial or employee parking facility, and provisions are made to restrict its use to customers of the establishment associated with the parking facility.

(3) Employee parking located outside of the Boston core area after October 15, 1973, shall be exempt from the freeze provided the employee parking facility is not utilized as a commercial parking facility and the provisions of paragraphs (h) and (k) of this section are complied with.

(d) After August 15, 1973, no person shall commence construction of any parking facility, or modification of any existing parking facility in the Boston Intrastate Region unless and until he has obtained from the Administrator or from an agency approved by the Administrator a permit stating that construction or modification of such facility will not interfere with the attainment or maintenance of applicable Federal air quality standards and that the construction or modification of the facility will comply with the requirements of paragraphs (h) and (k) of this section. This paragraph shall not apply to any proposed parking facility for which a general construction contract was finally executed by all appropriate parties on or before August 15, 1973.

(e) After August 15, 1973, no person shall commence construction of any parking facility or modification of any existing facility in the freeze area unless and until he has obtained from the Administrator or from an agency approved by the Administrator, in addition to the permit required by paragraph (d) of this section, a permit stating that construction or modification of such facility will be in compliance with the parking freeze established by paragraph (c) of this section. This paragraph shall not apply to any proposed parking facility for which a general construction contract was finally executed by all appropriate parties on or before August 15, 1973.

(f) In order for any agency to be approved by the Administrator for purposes of issuing permits pursuant to paragraphs (d) and (e) of this section, such agency shall demonstrate to the satisfaction of the Administrator that:

(1) Requirements for permit applications and issuance have been established. Such requirements shall include but not be limited to a condition that before a permit may be issued the following findings of fact or factually supported projections must be made:

(i) The location of the facility.

(ii) The total motor vehicle capacity before and after the proposed construction or modification of the facility.

(iii) The number of people using or engaging in any enterprises or activities that the proposed facility will serve.

(iv) In the event the facility contains employee parking spaces, the parking space/employee ratio that will occur as a result of construction or modification of the facility.

(v) The number of motor vehicles using the proposed facility on an average hourly and a peak hour basis.

(vi) A projection of the geographic areas in the community from which people and motor vehicles will be drawn to the facility. Such projections shall include data concerning the availability of public transit from such areas.

(2) Criteria for issuance of permits have been established and published. Such criteria shall include, but not be limited to:

(i) Full consideration of all facts contained in the application.

(ii) Provisions that no permit will be issued if the construction or modification of the facility will result in a net increase of vehicle miles traveled within the Boston core area.

(iii) Provisions that no permit will be issued if construction or modification of the facility will not comply with the requirements of paragraphs (c), (h), and (k) of this section.

(iv) Provisions that no permit will be issued if construction or modification of the facility will result in interference with the attainment or maintenance of national air quality standards.

(3) Agency procedures provide that no permit for the construction or modification of a facility covered by this section shall be issued without notice and opportunity for public hearing. The public hearing may be of a legislative type; the notice shall conform to the requirements of 40 CFR 51.4(b); and the agency rules of procedures may provide that if no notice of intent to participate in the hearing is received from any member of the public (other than the applicant) prior to 7 days before the scheduled hearing date, no hearing need be held. If notice of intent to participate is required, the fact shall be noted prominently in the required hearing notice.

(g) On or before January 31, 1974, each employer shall report to the Administrator, or his designee, the number of his employees and of his employee parking spaces.

(h) On or before May 31, 1975, each employer shall reduce the number of his available employee parking spaces at each employment facility by the greater of (i) 25 percent of the spaces available at such facility on October 15, 1973, or (ii) that amount of spaces necessary to attain a parking space/employee ratio of 0.75 at such facility. Subject to the provisions of paragraph (k) of this section, future increases in employee parking spaces shall be permitted for a facility only to the extent the parking space/employee ratio resulting from the foregoing reduction is maintained for such facility.

(i) On or before July 31, 1974, each employer shall submit to the Administrator, or his designee, an action plan to meet the requirements of paragraph (h) of this section. Before submittal to the Administrator, each action plan must be approved by the chief executive of the local jurisdiction in which the employment facility is located. Each action plan shall include the following as a minimum:

(1) The procedure by which the employer will provide for the reduction in employee parking spaces, such as painting over or roping off the spaces designated for employee parking, pursuant to this regulation.

(2) A procedure by which the employer shall ensure that his employees do not park outside the employer's designated employee parking area within his facility.

(3) A procedure satisfactory to the Administrator in detail and substance by which the employer shall provide assistance to his employees for any necessary adjustment from single occupancy automobile transportation to carpooling or mass transit usage that may result from implementation of this section. By way of example and not limitation, the procedure may include such measures as computerized carpooling, minibus service from place of employment to mass transit parking lots, or a payroll deduction plan for commuter transit passes.

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(4) A timetable for implementation of the requirements of paragraph (h) of this section prior to May 31, 1975.

(j) The chief executive officer of each municipality in the Boston Intrastate Region that contains an employer subject to the requirements of paragraph (h) and (i) of this section shall submit to the Administrator no later than September 30, 1974, an action plan satisfactory to the Administrator in form and substance showing the steps the municipality will take to prohibit on-street parking by commuting employees outside the freeze area. Such action plan shall include as a minimum the following steps:

(1) Designation of one or more agencies responsible for the administration and enforcement of the program.

(2) Procedures (such as an on-street parking ban to non-residents between 7 and 10 a.m.), by which the prohibitions provided for in this paragraph shall be accomplished.

(3) Procedures by which the designated agency will enforce the prohibition provided in this paragraph.

(4) Procedures for the review and approval/disapproval of employer action plans required by paragraph (i) of this section.

(5) A timetable for implementation of the requirement of this paragraph prior to May 31, 1975.

(k) Provided that the provisions of paragraphs (d) and (e) of this section are complied with, new employee parking spaces may be established at new employment facilities, or at existing facilities where employment significantly and permanently increases, provided that the resulting parking space/employee ratio for such facility shall not exceed the ratio for new employment facilities for that area of the Region. Such ratios will be established by the Administrator on an area-by-area basis within the Region prior to January 1, 1975, and will in no case be greater than 0.75. Prior to the time such ratios are promulgated by the Administrator, the applicable ratio for the entire Region for purposes of this paragraph shall be 0.75.

(l) When employment is reduced at a facility, the number of employee parking spaces shall be reduced to the extent necessary to preserve the parking space/employee ratio in effect for such facility.

§ 52.1136 Regulation for off-street parking facilities.

(a) "Off-street parking space" means any area or space below, above or at ground level, open or enclosed, which is used for parking one light-duty vehicle at any given time except on any public highway, street, or roadway.

(b) A surcharge of 25¢/hour shall be applied as provided in subparagraph (c) of this section to any contract or other agreement whereby a motor vehicle is parked for a fee in any publicly or privately owned off-street parking facility in the Boston Intrastate Region. Such surcharge shall be collected by the Commonwealth or the City of Boston or their designated agents. The net proceeds of such surcharge shall be utilized to assist payments of the Metropolitan Boston Transit Authority's net cost of services assessable upon the City of Boston and for mass transit improvements within the Boston Intrastate Region.

(c) The surcharge provided for in paragraph (b) of this section, shall be applicable beginning May 31, 1975, to all off-street parking spaces at Logan Airport and in the Boston core area. The surcharge shall be applicable as a minimum between the hours of 7 a.m. and 7 p.m. on days other than Saturdays, Sundays, or legal holidays and the maximum total daily surcharge shall not exceed $2.50. The surcharge shall not apply to utilization of off-street parking facilities by handicapped persons and disabled veterans (HP and V license plates) to employee parking spaces conforming with the requirements of paragraphs (h) and (k) of section 52.1135 of this chapter, or to residential parking facilities as defined in paragraph (a)(7) of § 52.1135 of this chapter.

(d) If a vehicle is to be stored in an off-street parking space for more than one day without leaving said space, the surcharge provided for in paragraph (b) of this section shall apply only to the first day of storage of the vehicle.

(e) Each person and governmental entity owning, controlling or operating an off-street parking facility within the Boston core area and Logan Airport shall by December 1, 1973, report to the Administrator or his designee the number of motor vehicle parking spaces in each such facility under its ownership or control and the average number of such parking spaces occupied at 10 a.m. on weekdays.

(f) Each such owner or operator of any off-street parking facility located within the Boston core area shall reduce the number of motor vehicle parking spaces available during the period 7 a.m. to 10 a.m. on days other than Saturdays, Sundays, or legal holidays from the number in existence as of December 1, 1973, by a percentage to be established by the City of Boston for each such facility. Such percentages shall be designated by the City of Boston on or before July 31, 1974. These percentages shall be such that the total available off-street parking supply in the Boston core area shall not exceed 60 percent of the supply available (including that under construction) on October 15, 1973. This reduction shall be accomplished not later than March 1, 1975.

(g) Each such owner or operator of an off-street parking facility subject to the requirements of this section shall submit to the Administrator prior to December 31, 1974, a detailed compliance schedule showing the steps it will take to achieve the reduction in motor vehicle parking spaces required by paragraph (f) of this section and for the collection of the surcharge. Such schedule shall provide for the designation, in some manner obvious to the public (such as blocking off entire floors, painting over or roping off spaces) of the space eliminated pursuant to this section.

§ 52.1137 Regulation for Logan Airport egress toll.

(a) All vehicles leaving Logan International Airport between the hours of 7 a.m. and 7 p.m. weekdays (except legal holidays) shall be subject to a toll to be collected by the Massachusetts Port Authority in the amount of $1 between 10 a.m. and 4 p.m., and $2 between the hours of 7 a.m. to 10 a.m. and 4 p.m. to 7 p.m. The toll shall be collected at a toll booth (or booths) to be located on the egress roads from Logan International Airport or by some equivalent method. The revenue generated by the toll shall be utilized to assist the implementation of additional buses, limousines, and other mass transit service to and from Logan Airport and for dispatching services to facilitate pooled use of taxis to and from Logan Airport.

(b) Exemptions from this toll may be provided to employees of Massport and of firms located at Logan Airport, and to buses, airport limousines, taxis with two or more passengers, trucks, emergency vehicles, and other vehicles that present evidence of having been stored in an off-street parking facility at Logan Airport for more than four continuous hours.

(c) The Massachusetts Port Authority shall (1) submit to the Administrator, no later than December 31, 1974, a detailed compliance schedule showing the procedure it will adopt to collect the toll and (2) prior to May 31, 1975, shall collect said toll from vehicles as provided in paragraph (a) of this section.

§ 52.1138 Regulation for computer carpool matching.

(a) "Carpool matching" means assembling lists of commuters with similar daily travel patterns and providing a mechanism by which persons on such lists may be put in contact with each other the purpose of forming carpools.

(b) This section is applicable in the Boston Intrastate Region if the American Legal Association/WBZ "Commuter Computer Club Car" is discontinued.

(c) The Commonwealth of Massachusetts shall, unless otherwise exempted by the Administrator on the basis of a finding of the continued existence of equivalent (private) service, establish a computer-aided carpool matching system that is conveniently available to the general public and to all employees of employers having more than 50 employees within the Intrastate Region who operate light-duty vehicles on streets and highways over which the Commonwealth has ownership or control. No later than 3 months after discontinuation of the "Commuter Computer Club Car," the Commonwealth shall submit legally adopted regulations to the Administrator establishing such a system. No provisions of such regulations shall have an effective date later than 3 months from the date of adoption. The regulations shall include:

(1) A method of collecting information that will include the following as a minimum:

(i) Provisions for each affected employee to receive an application form with a cover letter describing the matching program.

(ii) Provision on each application for applicant identification of commuting time, origin, and destination, and the applicant's desire to ride only, drive only, or share driving.

(iii) A computer method of matching information that will have provisions for locating each applicant's origin and destination within the Boston Intrastate and the Interstate Regions and matching applicants with similar origins and destinations and travel schedules and enabling the persons so matched to make contact with each other at the request of any one of them.

(iv) A method of providing continuing service such that the matched lists of all applicants are retained and made available for use by new applicants, application forms are currently available, and the master lists are periodically updated to remove applicants who no longer meet the governing criteria and add new applicants who do.

(v) Designation of an agency or agencies responsible for operating, overseeing, and maintaining the computer carpool matching system.

§ 52.1139 Preferential bus/carpool treatment.

(a) Definitions:

(1) "Carpool" means a motor vehicle containing three or more persons.

(b) This section is applicable in the Boston Intrastate Region.

(c) No later than the dates set forth in paragraph (f) of this section, on the Southeast Expressway from East Milton Square to South Station Tunnel, at least one inbound lane shall be open only to buses and carpools from 6:30 to 9:30 a.m. and at least one outbound lane shall be open only to buses and carpools from 3:30 to 6:30 p.m. on all days except Saturdays, Sundays, and holidays.

(d) No later than April 15, 1974, Interstate Route 93 shall be utilized only by buses, trucks, and carpools from Somerville Avenue in Somverville to the Boston core area inbound between the hours of 6:30 and 9:30 a.m., and outbound between the hours of 3:30 and 6:30 p.m. on all days except Saturdays, Sundays, and legal holidays.

(e) The Commonwealth shall submit to the Administrator no later than August 1, 1974, a detailed compliance schedule in form and substance satisfactory to the Administrator showing the steps the Commonwealth will take to establish the highway use restrictions contained in paragraphs (c) and (d) of this section and to enforce the restrictions. The schedule shall include the amount and source of funds to implement this section and the date by which such funds will be available.

(f) The lanes established by paragraph (c) of this section must be prominently indicated by distinctive painted lines, pylons, overhead signs, or physical barriers. Fifty percent of such lanes shall be established and fully operational by March 31, 1975; 100 percent of such lanes shall be established and fully operational by May 31, 1975.

(g) The section of Interstate Route 93 established by paragraph (d) of this section shall be prominently indicated by signs and barriers at each entry ramp.

(h) No existing emergency lane on that section of the Southeast Expressway subject to paragraph (c) of this section shall be converted for bus/carpool use or general traffic use unless as a consequence two lanes shall thereby be open only to buses and carpools on that portion of the Southeast Expressway where such conversion is effective.

(i) The Commonwealth shall, by May 1, 1974, perform and complete feasibility studies for submission to the Administrator on the following measures:

(1) A north/south bus lane system through the Boston core area with Washington street utilized in one direction.

(2) Alternative mechanisms for bus/carpool preferential treatment on the Southeast Expressway, Central Artery and Route 1, including but not limited to:

(i) A wrong way bus/carpool lane.

(ii) A ramp metering system for preferential access given to buses and carpools.

(iii) A regulation restricting the downtown on and off ramps for use by buses and carpools only during commuting hours (off ramps between 6:30 a.m. and 9:30 a.m. and on ramps between 3:30 p.m. and 6:30 p.m.).

(3) Toll restructuring on the Massachusetts Turnpike Authority and Massachusetts Port Authority bridges, tunnels, and roads so as to provide incentives for buses and carpools, such as but not limited to:

(i) Preferential lanes at toll gates so as to allow buses and carpools lower fares.

(ii) A policy of raising tolls so as to collect all revenues collected throughout a week during commuting hours and allowing free usage during other times.

§ 52.1140 Regulation for semiannual inspection and maintenance.

(a) Definitions:

(1) "Inspection and maintenance program" means a program to reduce emissions from in-use vehicles through identifying vehicles that need emission control related maintenance and requiring that such maintenance be performed.

(2) "Light-duty vehicle" means a gasoline-powered motor vehicle rated at 6,000 lb GVW or less.

(3) "Medium-duty vehicle" means a gasoline-powered motor vehicle rated at more than 6,000 lb GVW and less than 10,000 lb GVW.

(4) All other terms used in this paragraph are defined in 40 CFR 51 Appendix N, are used herein with the meanings therein defined.

(b) This section is applicable in the Boston Intrastate Region.

(c) The Commonwealth of Massachusetts shall establish an inspection and maintenance program applicable to all gasoline-powered light-duty and medium-duty vehicles registered in the Boston Intrastate Region that operate on streets and highways over which it has ownership or control. No later than April 1, 1974, the Commonwealth shall submit legally adopted regulations to EPA establishing such a program. Antique motor vehicles designated by the appropriate state registration procedures shall be exempt from the requirements of this section. The regulation shall include:

(1) Provisions for inspection of all such motor vehicles at periodic intervals at least twice each year by means of a loaded emission test.

(2) Provisions for inspection failure criteria consistent with the failure of 40 percent of the vehicles tested during the first inspection cycle.

(3) Provisions to require that failed vehicles receive, within 2 weeks, the maintenance necessary to achieve compliance with the inspection standards. This shall include sanctions against noncomplying individual owners and repair facilities, retest of failed vehicles following maintenance, a certification program to insure that repair facilities performing the required maintenance have the necessary equipment, parts, and knowledgable operators to perform the tasks satisfactorily, and such other measures as may be necessary or appropriate.

(4) A program of enforcement, such as a spot check of idle adjustment, to insure that, following maintenance, vehicles are not subsequently readjusted or modified in such a way as would cause them no longer to comply with the inspection standards. This program shall include appropriate penalties for violation.

(5) Designation of an agency or agencies responsible for conducting, overseeing, and enforcing the inspection and maintenance program.

(d) Commencing August 1, 1976, the State shall not register or allow to operate on its highways any light-duty vehicle or medium-duty vehicle that does not comply with the applicable standards and procedures adopted pursuant to paragraph (c) of this section. This shall not apply to the initial registration of a new motor vehicle.

(e) Commencing August 1, 1976, no owner of a light-duty or medium-duty vehicle shall operate or allow the operation of any such vehicle that does not comply with the applicable standards and procedures adopted pursuant to paragraph (c) of this section. This shall not apply to the initial registration of a new motor vehicle.

(f) The Commonwealth of Massachusetts shall submit, no later than January 1, 1974, a detailed compliance schedule showing the steps it will take to establish and enforce a State-operated inspection and maintenance program pursuant to paragraph (c) of this section, including the text of any needed statutory proposals, and needed regulations that it will propose for adoption. The compliance schedule shall also include:

(1) The date by which the State will recommend the needed legislation to the State legislature;

(2) The date by which the necessary equipment will be ordered;

(3) A statement from the Governor and State Treasurer identifying the sources and amounts of funds for the program. If funds cannot legally be obligated under existing statutory authority, the text of needed legislation must be submitted.

§ 52.1141 Regulation for vacuum spark advance disconnect.

(a) "Vacuum spark advance disconnect" means a device or system installed on the vehicle that prevents the ignition vacuum advance from operating either when the vehicle's transmission is in the lower gears, or when the vehicle is traveling below a predetermined speed.

(b) This section is applicable in the Boston Intrastate Region.

(c) Prior to January 1, 1976, all gasoline-powered, light-duty vehicles of model year prior to 1963 and subject under presently existing legal requirements to registration in the area described in paragraph (b) of this section, shall be equipped with an appropriate vacuum spark advance disconnect device. Exemptions shall be granted for antique vehicles designated by the appropriate state registration procedures.

(d) The Commonwealth of Massachusetts shall submit, no later than January 1, 1974, a detailed compliance schedule showing the steps it will take to implement and enforce this requirement. Such schedule shall include, as a minimum, the following:

(1) A date by which the State will evaluate and approve devices for use in this program. Such date shall be not later than August 1, 1974.

(2) A date by which installation of this equipment shall commence. Such a date shall be no later than January 1, 1975.

(3) A date by which all vehicles subject to this section will be equipped with such devices. Such date shall be no later than January 1, 1976.

(4) Designation of any agency or agencies responsible for evaluating and approving such devices for use on vehicles subject to this paragraph.

(5) Designation of an agency or agencies responsible for ensuring that the prohibitions of paragraph (e)(2) of this section shall be enforced.

(6) A method and proposed procedures for ensuring that those persons installing the devices have the training and ability to perform the needed tasks satisfactorily and that an adequate supply of devices will be available.

(7) Provision (apart from the requirements of any general program for periodic inspection and maintenance of vehicles) for emissions testing at the time of device installation or some other positive assurance that the device is installed and operating correctly.

(e) Commencing January 1, 1976 the following shall apply within the Boston Intrastate Region:

(1) The State shall not register a vehicle subject to this paragraph that is not equipped in accordance with paragraph (c) of this section.

(2) No owner of a light-duty vehicle subject to this paragraph shall operate or allow the operation of any such vehicle that is not equipped in accordance with paragraph (c) of this section.

(f) The State shall submit, no later than April 1, 1974, legally adopted regulations which assure full compliance with all provisions of this section.

§ 52.1142 Regulation for air bleed emission control device.

(a) "Air bleed control device" means a device that increases the flow of air into the engine in such a manner as to increase the efficiency of combustion at higher speeds, thus reducing emissions.

(b) This section is applicable in the Boston Intrastate Region.

(c) On or before August 1, 1976 all gasoline-powered, light-duty vehicles of model years 1968 to 1971 and all pre-1972 medium-duty vehicles subject under presently existing legal requirements to registration in the area described in paragraph (b) of this section, shall be equipped with an air bleed control device.

(d) The Commonwealth of Massachusetts shall submit, no later than January 1, 1974, a detailed compliance schedule showing the steps it will take to implement and enforce this requirement. Such schedule shall include, as a minimum, the following:

(1) A date by which the State will evaluate and approve devices for use in this program. Such date shall not be later than January 1, 1975.

(2) A date by which installation of this equipment shall commence. Such a date shall be no later than August 1, 1975.

(3) A date by which all vehicles subject to this paragraph will be equipped with such devices. Such date shall be no later than August 1, 1976.

(4) Designation of any agency or agencies responsible for evaluating and approving such devices for use on vehicles subject to this paragraph.

(5) Designation of an agency or agencies responsible for ensuring that the prohibitions of paragraph (e)(2) of this section shall be enforced.

(6) A method and proposed procedures for ensuring that those persons installing the devices have the training and ability to perform the needed tasks satisfactorily and that an adequate supply of devices will be available.

(7) Provision (apart from the requirements of any general program for periodic inspection and maintenance of vehicles) for emissions testing at the time of device installation or some other positive assurance that the device is installed and operating correctly.

(e) Commencing August 1, 1976, the following shall apply within the Boston Intrastate Region:

(1) The State shall not register a vehicle subject to this paragraph that is not equipped in accordance with paragraph (c) of this section.

(2) No owner of a light-duty or medium-duty vehicle subject to this paragraph shall operate or allow operation of any such vehicle that is not equipped in accordance with paragraph (c) of this section.

(f) The State shall submit, no later than April 1, 1974, legally adopted regulations which assure full compliance with all provisions of this section.

§ 52.1143 Regulation for oxidizing catalyst.

(a) Definitions:

(1) "Oxidizing catalyst" means a device installed in the exhaust system of the vehicle that utilizes a catalyst and, if necessary, an air pump to reduce emissions of hydrocarbons and carbon monoxide from that vehicle.

(2) "Fleet vehicle" means any of ten or more light-duty vehicles operated by the same person(s) or business and used principally in connection with the same or related occupations.

(b) This section is applicable in the Boston Intrastate Region.

(c) On or before May 31, 1977, all gasoline-powered fleet vehicles, all medium-duty vehicles of model year 1969 through 1974, and all private light-duty vehicles of model year 1974 that are able to run on 91 RON gasoline and subject to registration in the Boston Intrastate Region, shall be equipped with an appropriate oxidizing catalyst control device.

(d) The Commonwealth of Massachusetts shall submit, no later than April 1, 1974, a detailed compliance schedule showing the steps it will take to implement and enforce this requirement. Such schedule shall include as a minimum the following:

(1) A date by which the State will evaluate and approve devices for use in this program. Such date shall be not later than January 1, 1975.

(2) A date by which installation of this equipment shall commence. Such date shall be no later than December 1, 1975.

(3) A date by which all vehicles subject to this paragraph will be equipped with such devices. Such date shall be no later than May 31, 1977.

(4) Designation of any agency or agencies responsible for evaluating or approving such devices for use on vehicles subject to this paragraph.

(5) Designation of any agency or agencies responsible for ensuring that the prohibition of paragraph (e)(2) of this section shall be enforced.

(6) A method and proposed procedures for ensuring that those persons installing the devices have the training and ability to perform the needed tasks satisfactorily and that an adequate supply of devices will be available.

(7) Provision (apart from the requirements of any general program for periodic inspection and maintenance of vehicles) for emissions testing at the time of device installation or some other posi-

tive assurance that the device is installed and operating correctly.

(e) Commencing May 31, 1977, the following shall apply within the Boston Intrastate Region:

(1) The State shall not register a vehicle subject to this paragraph that is not equipped in accordance with paragraph (c) of this section. This shall not apply to the initial registration of a new motor vehicle. .

(2) No owner of a vehicle subject to this section shall operate or allow the operation of that vehicle within the Boston Intrastate Region if it is not equipped with an oxidizing catalyst. This shall not apply to the initial registration of a new motor vehicle.

(f) The State shall submit, no later than September 1, 1974, legally adopted regulations which assure full compliance with all provisions of this section.

§ 52.1144 Regulation on evaporative emissions from retail gasoline outlets.

(a) "Gasoline" means any petroleum distillate having a Reid vapor pressure of 4 pounds or greater.

(b) This section is applicable in the Boston Intrastate Region. The requirements for this section shall be in effect in accordance with 52.1147 of this subpart.

(c)(1) No person shall transfer gasoline from any delivery vessel into any stationary storage container with a capacity greater than 250 gallons unless such container is equipped with a submerged fill pipe and unless the displaced vapors from the storage container are processed by a system that prevents release to the atmosphere of no less than 90 percent by weight of organic compounds in said vapors displaced from the stationary container location.

(i) The vapor recovery portion of the system shall include one or more of the following:

(a) A vapor-tight return line from the storage container to the delivery vessel and a system that will ensure that the vapor return line is connected before gasoline can be transferred into the container.

(b) A refrigeration-condensation system or equivalent designed to recover no less than 90 percent by weight of the organic compounds in the displaced vapor.

(ii) If a "vapor-tight vapor return" system is used to meet the requirements of this section, the system shall be so constructed as to be readily added on to retrofit with an adsorption system, refrigeration-condensation system, or equivalent vapor removal system, and so constructed as to anticipate compliance with § 52.1144(d)(1).

(iii) The vapor-laden delivery vessel shall be subject to the following conditions:

(a) The delivery vessel must be so designed and maintained as to be vapor tight at all times.

(b) The vapor-laden delivery vessel may be refilled only at facilities equipped with a vapor recovery system or the equivalent that can recover at least 90 percent by weight of the organic compounds in the vapors displaced from the delivery vessel during refilling.

(2) Gasoline storage compartments of 1,000 gallons or less in gasoline delivery vehicles presently in use on October 15, 1973, will not be required to be retrofitted with a vapor return system until January 1, 1977.

(3) The provisions of this paragraph shall not apply to the following:

(i) Stationary containers having a capacity less than 550 gallons used exclusively for the fueling of implements of husbandry, provided, however, said containers are equipped with submerged fill pipes.

(ii) Any container having a capacity of less than 2,000 gallons installed prior to October 15 1973.

(iii) Transfers made to storage tanks equipped with floating roofs or their equivalent.

(d)(1) A person shall not transfer gasoline to an automotive fuel tank from gasoline dispensing systems unless the transfer is made through a fill nozzle designed to:

(i) Prevent discharge of hydrocarbon vapors to the atmosphere from either the vehicle filler neck or a dispensing nozzle;

(ii) Direct vapor displaced from the automotive fuel tank to a system wherein at least 90 percent by weight of the organic compounds in displaced vapors are recovered; and

(iii) Prevent automotive fuel tank overfills or spillage on fill nozzle disconnect.

(2) The system referred to in paragraph (d)(1) of this section can consist of a vapor-tight vapor return line from the fill nozzle-filler neck interface to the dispensing tank, to an adsorption, absorption, incineration, or refrigeration-condensation system or equivalent.

(3) Components of the system required by paragraph (c)(1) of this section can be used for compliance with this paragraph.

(4) If it is demonstrated to the satisfaction of the Administrator that it is impractical to comply with the provisions of paragraph (d)(1) of this section as a result of fill neck configuration, location, or other design features of a class of vehicles, the provisions of paragraph (d)(1) shall not apply to such vehicles. However, in no case shall such configuration exempt any gasoline dispensing facility from installing a system required by paragraph (d)(1) of this section.

§ 52.1145 Regulation on organic solvent use.

(a) Definitions:

(1) "Organic solvents" include diluents and thinners and are defined as organic materials which are liquids at standard conditions and which are used as dissolvers, viscosity reducers, or cleaning agents, except that such materials which exhibit a boiling point higher than 220° F. at 0.5 millimeters of mercury absolute pressure or having an equivalent vapor pressure shall not be considered to be solvents unless exposed to temperatures exceeding 220° F.

(2) "Solvent of high photochemical reactivity" means any solvent with an aggregate of more than 20 percent of its total volume composed of the chemical compounds classified below or which exceeds any of the following individual percentage composition limitations in reference to the total volume of solvent:

(i) A combination of hydrocarbons, alcohols, aldehydes, esters, ethers, or ketones having an olefinic or cycloolefinic type of unsaturation: 5 percent;

(ii) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene: 8 percent;

(iii) A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichoroethylene or toluene: 20 percent. Whenever any organic solvent or any constituent of an organic solvent may be classified from its chemical structure into more than one of the above groups of organic compounds, it shall be considered as a member of the most reactive chemical group, that is, that group having the least allowable percentage of total volume of solvents.

(3) "Organic materials" are chemical compounds of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, and ammonium carbonate.

(b) This section is applicable throughout the Boston Intrastate Region. The requirements of this section shall be in effect in accordance with § 52.1147.

(c) No person shall cause, allow, suffer, or permit the discharge into the atmosphere more than 15 pounds of organic materials in any 1 day, nor more than 3 pounds of organic materials in any 1 hour, from any article, machine, equipment, or other contrivance, in which any organic solvent or any material containing organic solvent comes into contact with flame or is baked, heat-cured, or heat-polymerized, in the presence of oxygen, unless said discharge has been reduced by at least 85 percent. Those portions of any series of articles, machines, equipment, or other contrivances designed for processing a continuous web, strip, or wire that emit organic materials and using operations described in this section shall be collectively subject to compliance with this section.

(d) No person shall cause, suffer, allow, or permit the discharge into the atmosphere more than 40 pounds of organic materials in any 1 day, nor more than 8 pounds in any 1 hour, from any article, machine, equipment, or other contrivance used under conditions other than described in paragraph (c) of this section for employing, or applying any solvent of high photochemical reactivity or material containing such photochemically reactive solvent, unless said discharge has been reduced by at least 85 percent. Emissions of organic materials into the atmosphere resulting from air or heated drying of products for the first

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12 hours after their removal from any article, machine, equipment, or other contrivance described in this section shall be included in determining compliance with this section. Emissions resulting from baking, heat-curing, or heat-polymerizing as described in paragraph (c) of this section shall be excluded from determination of compliance with this section. Those portions of any series of articles, machines, equipment, or other contrivances designed for processing a continuous web, strip, or wire that emit organic materials and using operations described in this section shall be collectively subject to compliance with this section.

(e) Emissions of organic materials to the atmosphere from the clean-up with a solvent of high photochemical reactivity, or any article, machine, equipment, or other contrivance described in paragraph (c) or (d) or in this paragraph, shall be included with the other emissions of organic materials from that article, machine, equipment or other contrivance for determining compliance with this section.

(f) No person shall cause, suffer, allow, or permit during any one day disposal of a total of more than 1.5 gallons of any solvent of high photochemical reactivity, or of any material containing more than 1.5 gallons of any such photochemically reactive solvent by any means that will permit the evaporation of such solvent into the atmosphere.

(g) Emissions of organic materials into the atmosphere required to be controlled by paragraph (c) or (d) of this section shall be reduced by:

(1) Incineration, provided that 90 percent or more of the carbon in the organic material being incinerated is converted to carbon dioxide, or

(2) Adsorption, or

(3) Processing in a manner determined by the Governor or his designee to be no less effective than either of the above methods.

(h) A person incinerating, adsorbing, or otherwise processing organic materials pursuant to this rule shall provide, properly install and maintain in calibration, in good working order, and in operation, devices as specified in the authority to construct, or as specified by the Governor or his designee, for indicating temperatures, pressures, rates of flow, or other operating conditions necessary to determine the degree and effectiveness of air pollution control.

(i) Any person using organic solvents or any materials containing organic solvents shall supply the Governor or his designee, upon request and in the manner and form prescribed by him, written evidence of the chemical composition, physical properties, and amount consumed for each organic solvent used.

(j) The provisions of this rule shall not apply to:

(1) The manufacture of organic solvents, or the transport or storage of organic solvents or materials containing organic solvents.

(2) The spraying or other employment of insecticides, pesticides, or herbicides.

(3) The employment, application, evaporation, or drying of saturated halogenated hydrocarbons or perchloroethylene.

(4) The use of any material, in any article, machine, equipment or other contrivance described in paragraph (c), (d), or (e) if:

(i) The volatile content of such material consists only of water organic solvents, and

(ii) The organic solvents comprise not more than 20 percent by volume of said volatile content, and

(iii) The volatile content is not a solvent of high photochemical reactivity as defined in paragraph (a) of this section, and

(iv) The organic solvent or any material containing organic solvent does not come into contact with flame.

(5) The use of any material, in any article, machine, equipment or other contrivance described in paragraph (c), (d), or (e) of this section if:

(i) The organic solvent content of such material does not exceed 20 percent by volume of said material, and

(ii) The volatile content is not a solvent of high photochemical reactivity, and

(iii) More than 50 percent by volume of such volatile material is evaporated before entering a chamber heated above ambient application temperature, and

(iv) The organic solvent or any material containing organic solvent does not come into contact with flame.

(6) The use of any material, in any article, machine, equipment, or other contrivance described in paragraphs (c), (d), or (e) if:

(i) The organic solvent content of such material does not exceed 5 percent by volume of said material, and

(ii) The volatile content is not a solvent of high photochemical reactivity, and

(iii) The organic solvent or any material containing organic solvent does not come into contact with flame.

§ 52.1146 Regulation on architectural coatings.

(a) "Architectural coating" means a coating used for buildings and their appurtenances.

(b) This regulation is applicable within the Boston Intrastate Region. All sources subject to this section shall be in compliance with paragraphs (c), (d), and (e) of this section on or before January 1, 1975.

(c) No person shall sell or offer for sale, for use within the Boston Intrastate Region, in containers of 1 quart capacity or larger, any architectural coating containing a solvent of high photochemical reactivity as defined in § 52.1145(a)(2).

(d) No person shall employ, apply, evaporate, or dry any architectural coating purchased in containers of 1 quart capacity or larger, containing a solvent of high photochemical reactivity.

(e) No person shall thin or dilute any architectural coating with a solvent of high photochemical reactivity.

§ 52.1147 Federal compliance schedules.

(a) Except as provided in paragraph (c) of this section, the owner or operator of a source subject to regulation under paragraph (c)(1) of § 52.1144 and § 52.1145 shall comply with the increments of progress contained in the following schedule:

(1) Final control plans for emission control systems or process modifications must be submitted prior to January 1, 1974.

(2) Contracts for emission control systems or process modifications must be awarded or orders must be issued for the purchase of component parts to accomplish emission control or process modification prior to March 15, 1974.

(3) Initiation of on-site construction or installation of emission control equipment or process modification must begin prior to July 15, 1974, except for purposes of paragraph (c)(1) of § 52.1144, the applicable date shall be January 1, 1975.

(4) On-site construction or installation of emission control equipment or process modification must be completed prior to April 15, 1975, except for purposes of paragraph (c)(1) of § 52.1144, the applicable date shall be February 1, 1976.

(5) Final compliance is to be achieved prior to Mal 31, 1975, except for sources subject to paragraph (c)(1) of § 52.1144 of this subpart. Final compliance for sources subject to paragraph (c)(1) of § 52.1144 of this subpart is to be achieved by March 1, 1976.

(6) Any owner or operator of stationary sources subject to compliance schedule in this subparagraph shall certify to the Administrator within 5 days after the deadline for each increment of progress, whether or not the required increment of progress has been met.

(7) Any gasoline dispensing facility subject to paragraph (c)(1) of § 52.1144 which installs a storage tank after October 15, 1973, shall comply with such paragraph by March 1, 1976. Any facility subject to such paragraph which installs a storage tank after March 1, 1976 shall comply with such paragraph at the time of installation.

(b) Except as provided in paragraph (d) of this section, the owner or operator of a source subject to paragraph (d)(1) of § 52.1144 shall comply with the increments of progress contained in the following compliance schedule:

(1) Final control plans for emission control systems or process modifications must be submitted prior to February 1, 1974.

(2) Contracts for emission control systems or process modifications must be awarded or orders must be issued for the purchase of component parts to accomplish emission control or process modification prior to June 1, 1974.

(3) Initiation of on-site construction or installation of emission control equipment or process modification must begin not later than January 1, 1975.

(4) On-site construction or installation of emission control equipment or process modification must be completed prior to May 1, 1977.

(5) Federal compliance is to be achieved prior to May 31, 1977.

(6) Any owner or operator of stationary sources subject to the compliance schedule in this subparagraph shall cer-

tify to the Administrator, within 5 days after the deadline for each increment of progress, whether or not the required increment of progress has been met.

(7) Any gasoline dispensing facility subject to paragraph (d)(1) of § 52.1144 which installs a gasoline dispensing system after the effective date of this regulation shall comply with the requirements of such paragraph by May 31, 1977. Any facility subject to such paragraph which installs a gasoline dispensing system after May 31, 1977, shall comply with such paragraph at the time of installation.

(c) Paragraph (a) of this section shall not apply:

(1) To a source which is presently in compliance with all requirements of paragraph (c)(1) of § 52.1144 and § 52.1145 of this subpart and which has certified such compliance to the Administrator by January 1, 1974. The Administrator may request whatever supporting information he considers necessary for proper certification.

(2) To a source for which a compliance schedule is adopted by the Commonwealth and approved by the Administrator.

(3) To a source whose owner or operator submits to the Administrator, by January 1, 1974, a proposed alternative schedule. No such schedule may provide for compliance after May 31, 1975. If promulgated by the Administrator, such schedule shall satisfy the requirements of this paragraph for the affected source.

(d) Paragraph (b) of this section shall not apply.

(1) To a source which is presently in compliance with paragraph (d)(1) of § 52.1144 of this subpart and which has certified such compliance to the Administrator by April 15, 1974. The Administrator may request whatever supporting information he considers necessary for proper certification.

(2) To a source for which a compliance schedule is adopted by the State and approved by the Administrator.

(3) To a source whose owner or operator submits to the Administrator by April 15, 1974, a proposed alternative schedule. No such schedule may provide for compliance after May 31, 1975. If promulgated by the Administrator, such schedule shall satisfy the requirements of this paragraph for the affected source.

(e) Nothing in this paragraph shall preclude the Administrator from promulgating a separate schedule for any source to which the application of the compliance schedule in paragraphs (a) or (b) of this section fails to satisfy and requirements of 40 CFR 51.15(b) and (c).

§ 52.1160 Semiannual and quarterly reports.

(a) All definitions are as used in 40 CFR 51.19.

(b) This regulation is applicable in the Boston Intrastate Region.

(c) The Commonwealth of Massachusetts or an agency designated by the Commonwealth and approved by the Administrator shall monitor the effective emission reductions occuring as a result of all retrofitting devices and inspection and maintenance programs required under § 52.1140 through § 52.1143 of this subpart.

(d) The data submitted pursuant to paragraph (c) of this section shall be in accordance with 40 CFR 51.19(d).

(e) No later than May 31, 1974, the State shall submit a detailed program to the Administrator demonstrating compliance with paragraph (c) of this section. The program description shall include the following:

(1) The administrative process to be used.

(2) The funding requirements, including a statement from the Governor or State Treasurer of their respective designees identifying the source and amount of funds for the program.

(3) A description of the methods to be used to collect the data.

(4) An agency or agencies responsible for conducting, overseeing, and maintaining the monitoring program.

(f) All data obtained by the monitoring program shall be included in the quarterly report submitted to the Administrator by the State, as required at 40 CFR 51.7. The first quarterly report shall cover the period January 1-March 31, 1975.

(g) The Commonwealth of Massachusetts shall report to the Administrator semiannually beginning May 15, 1974, the average daily VMT levels and the reductions from current levels of VMT a specified in the Technical Support Document for the Boston Intrastate Region.

(h) The VMT levels shall be based on representative traffic counts taken in the Boston Intrastate Region. The VMT reductions shall be identified for each applicable control measure designated in the State's implementation plan. Such reductions shall be reported in a format similar to that provided in Appendix M, 40 CFR Part 51.

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PART 52—APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS

Ohio Transportation Control Plan

On June 15, 1973, the Administrator disapproved the required Ohio air quality control plan revisions for the Metropolitan Dayton Intrastate, Metropolitan Toledo Interstate, and Metropolitan Cincinnati Interstate Air Quality Control Regions (AQCR) because they failed to fulfill the requirement for the timely submittal of transportation and/or land use control plans (38 FR 16550, June 22, 1973). The plan was to demonstrate the attainment of the photochemical oxidant air quality standard in the Regions by May 31, 1975.

Subsequent to this disapproval action, the Governor of Ohio submitted on July 2, 1973, the "Implementation Plan to Achieve Ambient Air Quality Standard for Photochemical Oxidant in the Cincinnati Air Quality Control Region" and the "Implementation Plan to Achieve Ambient Air Quality Standard for Photochemical Oxidant in the Toledo Air Quality Control Region." Ohio submitted its plan for the Dayton AQCR on July 24, 1973. EPA, Region V, received these plan revisions for the Cincinnati, Toledo, and Dayton Regions on July 16 and August 3, 1973, respectively. Receipt of the Ohio revisions was announced on August 15, 1973 (38 FR 22045). No comments were received on the plan revisions during the comment period provided.

On July 2, in response to court order and the requirements of the Clean Air Act and based upon information available to EPA at the time, a notice of proposed rule making setting forth a transportation control plan for the Metropolitan Cincinnati Interstate AQCR was issued (38 FR 17702); no new regulations were proposed for the Metropolitan Toledo Interstate and the Metropolitan Dayton Intrastate AQCR as it appeared that existing stationary source regulations in conjunction with the FMVCP would be adequate to ensure attainment of the national photochemical oxidant standard by May 31, 1975.

On July 25, 1973, the EPA held a public hearing on the proposed Federal plan for the Metropolitan Cincinnati AQCR.

PLAN ASSESSMENT

METROPOLITAN DAYTON INTRASTATE AQCR

EPA tendered a statement regarding the State's plan for the Metropolitan Dayton Intrastate AQCR at the Ohio Environmental Protection Agency hearing held on May 17, 1973. This statement, based on an emission inventory for 1972 and air quality data for 1972, indicated that 1972 air quality data should be used as a basis for determination of adequate strategies for the attainment of the national photochemical oxidant standard by May 31, 1975. Reevaluation of the emission inventories for both 1971 and 1972, reanalysis of air quality data for 1971 and 1972, and consideration of available air quality data for 1973 prompted reconsideration of the hearing statement. The revised emission inventories for 1971 and 1972 are both considered adequate. With regard to the air quality data for 1971, an abnormally high pollution level occurred on August 30. The occurrence of a similar event is considered unlikely, based upon two subsequent years of air quality data. It is not considered appropriate to base transportation control strategies on data resulting from such an event. All other air quality data for 1971 and 1972 are considered valid for characterization of oxidant levels occurring in the Dayton area. From the reanalysis of the 1971 and 1972 air quality data coupled with consideration of the revised Montgomery County hydrocarbon emission inventory, it is the opinion of the Administrator that the non-regulatory plan revisions submitted by the State indicate that the photochemical oxidant air quality standard will be attained in the Metropolitan Dayton Intrastate AQCR by May 31, 1975. The strategies outlined in the plan would rely upon strict enforcement of existing stationary source hydrocarbon regulations coupled with the estimated impact of the Federal Motor Vehicle Control Program.

Most recently the Region V EPA office has been apprised of presently unvalidated data for September of 1973 which, while continuing to verify the conclusions reached regarding the abnormality of the August 30, 1971, data, indicates that a further plan revision may be required to adequately assure attainment and maintenance of the oxidant standard. This future revision to the State Plan, if found necessary, would require the implementation of those contingency strategies outlined in the State Plan submitted on July 24, 1973. These strategies include:

(1) A county-wide inspection and maintenance program for light-duty vehicles. This system would require successful completion of the test on an annual basis as a prerequisite to vehicle registration. Programs similar to this are being developed and implemented in several urban areas across the nation.

(2) Improvements to the mass transit system to reverse the present trend of steadily declining ridership. The program would seek to improve transit ridership through a reduction in fares, a shuttle bus service for the Dayton Central Business District, and creation of a park and ride system.

Information employed to reach this determination of approval may be found in the Evaluation Report for the submittal plan. This report is available at the Freedom of Information Center, EPA, Room 329, 401 M Street SW., Washington, D.C. 20460; and at the Region V Office, 1 North Wacker Drive, Chicago, Illinois 60606.

METROPOLITAN TOLEDO INTERSTATE AQCR

EPA's evaluation of the Ohio plan indicates that the non-regulatory plan revision submitted by Ohio evidences assurance that existing regulations will provide for the attainment of the air quality standard in the Metropolitan Toledo Interstate AQCR area by May 31, 1975. The original State implementation plan as submitted January 31, 1972, indicated that a reduction in hydrocarbon emissions would occur between 1971 and 1975. The effects of the Federal Motor Vehicle Control Program were estimated, however, using national, instead of local, averages for vehicle age distribution and traffic growth and a presently obsolete method of computing automobile emissions. DeLeuw, Cather, and Company gathered transportation data characteristic of Toledo and utilized the presently approved methodology for computing motor vehicle emissions that is detailed in Compilation of Air Pollutant Emission Factors, EPA Publication AP-42. Their calculations, found in Appendix C of the Ohio plan for Toledo, indicates that mobile sources contribute a smaller percentage of hydrocarbon emissions than originally estimated. Therefore, control of stationary sources was found to have a greater effect on the overall reduction of hydrocarbons than originally estimated. Information employed to reach this determination is documented in the Evaluation Report for the Metropolitan Toledo Interstate AQCR. This report is available at the Freedom of Information Center, Environmental Protection Agency, Room 329, 401 M Street SW., Washington, D.C. 20460, and the Region V Office, 1 North Wacker Drive, Chicago, Illinois 60606.

METROPOLITAN CINCINNATI INTERSTATE AQCR

Review of the State plan for the Metropolitan Cincinnati AQCR indicates that the plan as submitted is marginally inadequate in itself to ensure the attainment of the air quality standard by May 31, 1975. Thus, it is necessary to supplement the applicable plan with a Federal inspection/maintenance program. Information employed in reaching this determination may be found in the Technical Support Document that is available at the Freedom of Information Center, EPA, Room 329, 401 M Street, SW., Washington, D.C. 20460; and at the Region V Office, 1 N. Wacker Drive, Chicago, Illinois 60606.

Pollution in the AQCR. The Metropolitan Cincinnati AQCR is comprised of approximately 3000 square miles of land area located in the extreme southwestern portion of Ohio, the adjacent State of Indiana, and the Commonwealth of Kentucky. The Indiana portion includes Dearborn and Ohio Counties; the Kentucky portion includes Boone, Campbell, Kenton, Carroll, Gallatin, Grant, Owen, and Pendleton Counties; and the Ohio portion includes Butler, Clermont, Hamilton, and Warren Counties. Since the Administrator, on May 31, 1972, approved the plans submitted by Indiana and Kentucky demonstrating the attainment of the national photochemical oxidant standard in those states' portions of the AQCR, this proposal is directed at attainment of the standard in the Ohio portion of the AQCR. The population of the AQCR is about 1.7 million persons, approximately 80 percent of whom reside within the Ohio portion of the AQCR. (Sixty percent resides within Hamilton County.)

The primary national ambient air quality standard for photochemical oxidants is 160 $\mu g/m^3$ (0.08 ppm) average for a 1-hour period not to be exceeded more than once per year. In 1971 this standard was exceeded 59 times in downtown Cincinnati. The second highest concentration was 277 $\mu g/m^3$ (0.14 ppm) and is the basis for the calculations in the Ohio Implementation Plan, which requires a 43 percent reduction in total hydrocarbon emissions according to Appendix J (40 CFR Part 51). There is no reason to believe that 1971 was a year of unusually high oxidant concentrations in Cincinnati; in fact, comparable concentrations were measured in previous years. This concentration was not exceeded during the first two quarters of 1972; validated air quality data for the last two quarters of 1972 are not yet available. The original implementation plan included a commitment to enlarge the air monitoring network for measuring oxidants in the AQCR.

Ohio Transportation Control Plan. The State plan revision estimates that the applicable standards will be attained by July 1975 in the Metropolitan Cincinnati Interstate AQCR through the enforcement of previously adopted stationary source hydrocarbon regulations as submitted with the January 31, 1972, Ohio State Implementation Plan, through the completion of various highway improvements, and through the implementation of the Federal Motor Vehicle Control Program (FMVCP). This plan revision contains a reevaluation of the effects of the above-mentioned measures and contains no new control measures. The plan estimates that a 44 percent reduction in hydrocarbon emissions will occur with implementation of the plan within Hamilton County between 1971 and mid-1975.

The State plan indicated that the estimated reductions in hydrocarbon emissions from stationary sources were the result of an updated emission inventory using the emission factor techniques outlined in the EPA document entitled *Compilation of Air Pollution Emission Factors* (AP-42). In addition, the State plan projected considerable reductions in reactive hydrocarbon emissions through the strict enforcement of State regulation AP-5. Because the claimed emission reductions rely in many instances upon solvent switching by a substantial percentage of the total stationary sources, the EPA believed these estimates to be optimistic at best, since serious questions exist today regarding not only the availability of the necessary amounts of non-reactive solvents, but also the operational problems expected to occur through the total use of the non-reactive solvents now on the market. However, the Administrator has accepted the stationary source emission reductions claimed with some reservation, realizing that some margin of safety could be obtained by not approving certain more questionable emission reductions claimed elsewhere in the State plan.

The estimated impact of the FMVCP was calculated by a private consultant to the EPA using 1971 and 1975 traffic data supplied by the City of Cincinnati. The actual emission factors applied in the analysis were calculated using the techniques described in AP-42. Adjustments were made by EPA to effect the interim 1975 automobile emission standards. The overall estimates of hydrocarbon emission reductions was believed to be reasonable and was consequently accepted by the Administrator.

The remainder of the overall hydrocarbon emission reductions set forth in the State plan was primarily due to the estimated impact of the completion of several bridges in the Metropolitan Cincinnati Area, in conjunction with the anticipated impact of some associated highway improvements. These estimates were carefully studied by the Administrator based on two questions:

(1) Will the bridge completions and anticipated highway improvements actually serve to decrease vehicular congestion and increase average vehicle speeds to the extent estimated in the State plan?

10. Section 52.1145 is amended by amending subparagraphs 52.1145 (j)(4) (iv) and 52.1145 (j)(5)(iv) and by adding a new subparagraph (j)(7) and by adding a new paragraph (k) as follows:

(j)(4)(iv) The organic solvent or any material containing organic solvent does not come into contact with flame. This last stipulation applies only for those articles, machines, equipment, or other contrivances that are constructed or modified after November 8, 1973.

(j)(5)(iv) The organic solvent or any material containing organic solvent does not come into contact with flame. This last stipulation applies only for those articles, machines, equipment or other contrivances that are constructed or modified after November 8, 1973.

(j)(7) - An article, machine, equipment or other contrivance described in (c), (d), (e), or (g) used exclusively for chemical or physical analyses provided that -

(i) The exemption is approved in writing by the Governor or his designee.

(ii) The operator of said article, machine, equipment or contrivance is not an integral part of the production process.

(iii) The emissions from said article, machine, equipment or other contrivance shall not emit more than 800 lbs. in any calendar month.

(k) Effective May 31, 1977, no person shall cause, suffer, allow or permit the discharge into the atmosphere of more than 3,000 lbs. of organic material in any one day, nor more than 450 lbs. in any one hour from any facility unless said discharge has been reduced by installation of abatement controls by at least 85 percent. Emissions of organic materials into the atmosphere resulting from air or heated drying of products for the first 12 hours after their removal from any article, machine, equipment, or contrivance used for employing or applying any organic material shall be included in determining compliance with this section. Emissions resulting from baking, heat-curing or heat polymerizing as described in paragraph (c) shall be excluded from any determination of compliance with this section.

APPENDIX B

QUESTIONNAIRE FORMS

official use
Rec. by__________Date:_______
SIC____________________
X,Y____________________

I. GENERAL INFORMATION

A. Company Name____
Plant Address______________________City______________Zip Code_______
Nearest Street Intersection____________________________________
Mailing Address____________________City______________Zip Code_______

B. Person to contact about form______________________________
Telephone________________________Title_______________________

C. Approximate number of employees______________

D. Nature of Business____
____

E. Normal Operating schedule
__________Hrs./day__________days/wk.__________wks/yr.

F. Approximate Percent Seasonal Operation:

Dec.-Feb.	Mar-May	Jun-Aug	Sept.-Nov.

G. Are volatile organic or solvent-containing materials such as cleaning fluids, coatings, adhesives, inks, etc. used in your operation? ____ Yes ____ No

If NO, sign form and return

If YES, sign form and complete only the sections pertaining to your operation:

Page
II. Dry Cleaning -- 2, 9 & 10
III. Degreasing --- 3, 9 & 10
IV. Surface Coating Applications
  A. Fabric and Rubberized -------------------------------- 4, 9 & 10
  B. Protective or Decorative other than IV-A -------------- 5, 9 & 10
  C. Printing --- 6, 9 & 10
  D. Miscellaneous Surface Coatings (Adhesives, Paper, Leather, films, Glass etc) -------- 7, 9 & 10
V. Chemical Manufacturing Industries ------------------------ 8, 9 & 10

Signature ________________________ Date ____________________

II. DRY CLEANING

A. Amount of clothes cleaned per year ________________tons.

B. Type of dry cleaning unit ☐ hot or dry-to-dry
☐ cold or transfer

C. Type and amount of solvent cleaner purchased in 1973.
Perchloroethylene_________________________Gal./Yr.
Stoddard solvent _________________________Gal./Yr.
Other (specify) _________________________Gal./Yr.
Other (specify) _________________________Gal./Yr.

D. Supplier of solvent - Name and address
Perchlorethylene ____
____
Stoddard Solvent ____
____
Other (specify) ____
____
Other (specify) ____
____

E. Please complete Section VI, page 9.

If you have any questions about this section please contact:

Mr. Roger Schilling
Field Representative for
International Fabricare Institute
5 Shawsheen Ave.
Bedford, Mass.
(617) 275-7583

III. DEGREASING OPERATIONS

A. Type of degreasing: ☐ cold solvent cleaning
☐ vapor degreasing

B. Type and amount of solvent purchased for degreasing operations.

1) Stoddard ____________________ Gal./yr.
2) 1,1,1-Trichloroethane (Chlorothene VG) ____________________ Gal./yr.
3) Perchloroethylene ____________________ Gal./yr.
4) Methylene chloride ____________________ Gal./yr.
5) Trichloroethylene ____________________ Gal./yr.
6) Other (specify) ____________________ Gal./yr.
7) Other (specify) ____________________ Gal./yr.

C. Suppliers of Solvents

____
____

____
____

____
____

D. Waste solvent disposal method

____

E. Amount of each solvent returned for reprocessing to vendor or collector

1) Stoddard ____________________ Gal./yr.
2) Trichloroethane ____________________ Gal./yr.
3) Perchloroethylene ____________________ Gal./yr.
4) Methylene chloride ____________________ Gal./yr.
5) Trichloroethylene ____________________ Gal./yr.
6) Other (specify) ____________________ Gal./yr.
7) Other (specify) ____________________ Gal./yr.

F. Please complete Section VI, page 9.

IV-A. FABRIC OR RUBBERIZED COATING APPLICATION

(1) Material(s) being coated ________________________.

(2) Type of coating process:

Source No.[*]	State Coating Process: Impregnation, "Wet" Coating, Hot Melt Coating, Lamination	Type of Coating[**]	Amount of Coating (Gal/Yr)	Type[‡] and % of Vehicle Solvent		Type[‡] and Amount of Solvent Added to Coating (Gal/Yr)	

(3) Type[‡] of cleaning solvent _______________ ______, Amount ______________ (Gal/Yr)

_________________________, Amount ______________ (Gal/Yr)

(4) Is any solvent returned to supplier or collector?

______No ______Yes Type[‡]_________________, Amount ____________ (Gal/Yr)

(5) Please complete Section VI, p. 9; use same Source No.

[*] A source is an individual or similar pieces of equipment such as coaters, dryers, etc. It should correspond to the Source No. on page 9. If applicable, it should also correspond to previously reported sources in "Air Pollution Emissions Report" (Form 158-R75)

[**] Polyvinyl chloride, polyurethanes, etc.

[†] Toluene, naphtha, mineral spirits, MEK, xylene, chlorinated hydrocarbon, other (specify).

IV-B. PROTECTIVE OR DECORATIVE COATINGS OTHER THAN FABRIC COATING

1. Indicate material being coated ______________________________

____

2. Type and amount of coating used:

Source* Number	State Application Method: Spraying, Dipping, Roller, Flow, etc.	Type of Paint**	Amount Gals./yr.	% solids	Type‡ and % of major solvents	

3. Type‡ and amount of thinner used for dilution and cleaning not included above

______________________, Amount ____________________ Gal./yr.

______________________, Amount ____________________ Gal./yr.

4. Please complete Section VI, page 9.

---

[*] A source is an individual or similar pieces of equipment such as spray booths, tanks, dryers, etc. It should correspond to the Source No. on page 9. If applicable, it should also correspond to previously reported sources in "Air Pollution Emissions report" (Form 158-R75)

[**] (1) paint, (3) varnish/shellac, (4) lacquer, (5) enamel, (6) primer

[†] If known, - acetone, isopropyl alcohol, MEK, butyl acetate, cellusolve, toluene, etc.

IV-C. PRINTING

(1) Material being coated ______________________________.

(2) Type of printing process:

Source No.[*]	State Printing Process: Letterpress, Flexographic, Lithographic, Gravure, Screen	Type of Ink[**]	Amount (lb/yr)	Type[†] and % of major solvents in ink	

(3) Type[‡] and amount of solvent used for dilution and cleaning not included above: __________________ Amount___________Gal./yr.

__________________ Amount___________Gal./yr.

(4) Please complete Section VI p. 9 ; ; use same Source No.

---

[*] A source is an individual or similar printing machines, dryers, etc. It should correspond to the Source No. on page 9. If applicable, it should also correspond to previously reported sources in "Air Pollution Emissions Report" (Form 158-R75).

[**] Solvent based, oil based, lacquer-type, etc.

[‡] Isopropyl alcohol, Ethanol, Propanol, Naphtha/Mineral Spirits, Toluene, MEK, other (specify)

IV-D. MISCELLANEOUS SURFACE COATING APPLICATION
(Adhesives, Paper, Leather, Films, Glass, etc)

(1) Material(s) being coated ____________________________________

(2) Type of coating process:

Source No.[*]	State Coating Process: Spray, Flow, Dip, Roller, Brush, etc.	Type of Coating[**]	Amount of Coating (Gal/Yr)	Type[‡] and % of Major Solvents in Coating	

(3) Type[‡] and additional amount of solvent used for dilution and cleaning not included above ______________, Amount ___________ Gal/Yr.

______________, Amount ___________ Gal/Yr.

(4) Please complete Section VI, page 9 ; Use the same Source No.

---

[*] A source number is an individual or similar pieces of equipment using surface coatings. It should correspond to the Source No. on page 9. If applicable, it should also correspond to previously reported sources in "Air Pollution Emissions Report" (Form 158-R75).

[**] Adhesive type, pigment coating, barrier coating, polymeric coating, inorganic coating, etc. (specify).

[‡] Branched alcohol, linear alcohol, ethyl acetate, toluene, xylene, ethers, MEK, naphtha, other (specify).

V. CHEMICAL MANUFACTURING INDUSTRIES

1) Brief Description of Process ____________________

Source No.*	Process or operation using organic materials**	Type of material processed +	Annual thruput at source	Type ++ and % of solvent in material		Quantity of volatile solvent lost to atmosphere during process lbs/yr.	Method used to determine emissions (guess or material balance)

2) Please complete Section VI, page 9 ; use same Source No.

---

[*] A source is an individual or similar pieces of equipment processing organic materials. It should correspond to the Source No. on page 9. If applicable, it should also correspond to previously reported sources in "Air Pollution Emissions Report" (Form 158-R75).

[**] Dryer, reactor, mixing tank, etc.

[+] Paint, varnish, shellac, lacquer, enamel, primer, adhesive, ink, other (specify).

[++] Acetone, MEK, butyl acetate, cellosolve, ethanol, naphtha, toluene, mineral spirits, other (specify).

VI. CONTROL AND STACK INFORMATION

Instructions:

(1) A number should be assigned to each piece of equipment that emits hydrocarbons or to a number of similar units that are vented to a common stack. The Source No. below should correspond to the sections previously filled out. If similar equipment have different control equipment please split the source number to a, b or c.

(2) Identify the process or operation from which hydrocarbons are emitted. For example, dry cleaner, degreasing tank, spray booth, reactor, etc. If more than one unit is emitting to a common stack, specify the number of units.

(3) Identify the hydrocarbon control method used such as after-burners, scrubbers, carbon adsorption, condensers, etc.

(4) Indicate approximate efficiency if known.

(5) Indicate installation date of control equipment.

(6) If hydrocarbons are emitted from a stack, provide height, diameter, temperature, velocity and flow rate information in appropriate columns.

	(1)	(2)	(3)	(4)	(5)	(6)				
						Stack Data				
	Source No.	Process or Operation	Hydrocarbon Control Equipment	Efficiency of Control Equipment	Date of Installation	Height (ft)	Inside Dia. (ft)	Temp. (°F)	Velocity (feet per sec)	Flow rate (ft³/min)
EXAMPLE	99	Paint Mixing Tank	Adsorber	80%	1969	20	1.5	77	20	2100

(7) PLEASE complete the last sections on page 10.

VII. BULK SOLVENT STORAGE

A. Please complete the following information for each storage tank greater than 250 gallons capacity.

Tank No.	Solvent Type	Capacity	Annual Thruput	Type of Fill and Control Equipment [*]

VIII. EFFECTS OF ENERGY CRISIS

Please state the changes in type and estimated annual consumption of solvent as a result of the energy crisis.

---

[*] Submerged fill, splash fill, return vent line, adsorber

1. Company name: ____

2. Tank location: (name a few nearby cross streets to aid us in locating
your facilities on our maps) ______________________________
____

3. Person completing form: ________________ Title: ______________

4. Phone number: ______________

5. Type of products stored: ______________________________
____

6. Specify number of fixed-roof tanks at this facility: ______________

7. Specify number of floating-roof tanks at this facility: ____________

8. Please use the following space to include any information that would aid us
in obtaining accurate emission estimates: ______________________
____
____
____
____
____
____

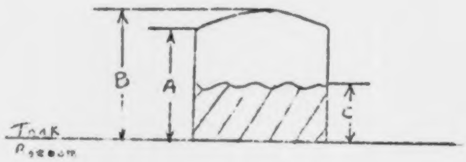
FOR FLOATING ROOF TANKS ONLY

Is tank above or below ground?	Type of product stored	Tank capacity in gallons	Tank diam. (feet)	Note type of paint (aluminum-diffuse, aluminum-speckle, white, or gray)	Is tank welded or riveted?	Is roof pan or pontoon?	Is seal single or double?	Were seals installed prior to 1942?	Tank throughout (gallons per year)	Average temp of stored product (°F)	What is the* vapor pressure (specify whether it is REID or TRUE and at what temperature)	Is there a vapor recovery system on tank?

FOR FIXED ROOF TANKS ONLY

Is tank above or below ground?	Type of product stored	Tank capacity in gallons	Tank diam. (feet)	Note type of paint (aluminum-diffuse, aluminum-speckle, white, or gray)		Is paint in good or poor condition?	Tank Dimensions (see diagram)			Tank throughput (gallons per year)	Average temp of stored product (°F)	What is the* vapor pressure (specify whether it is REID or TRUE and at what temperature)	Is there a vapor recovery system on tank?
				Shell	Roof		Height "A"	Height "B"	Average level of stored products Height "C"				

*In lieu of vapor pressure data state temperatures at 10%, 50% and 90% distillation points



APPENDIX C

GENERAL INSTRUCTIONS AND COVER LETTER FOR SURVEY

The Commonwealth of Massachusetts
Department of Public Health

600 Washington Street, Boston 02111

Division of
Environmental Health
Room 320

Dear Sirs:

The enclosed questionnaire is being sent under the auspices of the Massachusetts Department of Public Health, Division of Environmental Health, Bureau of Air Quality Control, in cooperation with the United States Environmental Protection Agency. The information being sought concerns the usage of organic (solvent containing) materials, and will be used to determine the effect of such materials on the air quality levels in the Pioneer Valley.

We would appreciate your assistance and cooperation in answering those questions that are applicable to your operations. Even if your facility does not utilize organic materials it is required that you return the questionnaire so that you will not be bothered by a follow-up phone call.

Many thanks for your cooperation in this effort.

Very truly yours,

Gilbert T. Joly

Gilbert T. Joly
Director
Bureau of Air Quality Control

GTJ/TP/mb

HYDROCARBON (SOLVENT) EMISSION STUDY FOR PIONEER VALLEY

The Bureau of Air Quality Control, Division of Environmental Health, requests your cooperation in providing the information asked for on the attached questionnaire concerning potential solvent emissions resulting from the operation of your facility.

BEFORE FILLING OUT THE QUESTIONNAIRE PLEASE READ THE FOLLOWING INSTRUCTIONS:

- Everyone receiving this form should complete Section I (General Information) and all other sections pertaining to his firm and return the questionnaire in the stamped, addressed envelope.
- Please return the questionnaire on or before Jan. 10, 1975. Your cooperation and expeditious completion of the inventory forms will be appreciated.
- Indicate any change in name and/or address in Section I.
- The information submitted should pertain to the calendar year of 1974.
- The questionnaire was designed for a wide variety of operations which involve extensive solvent usage. Accordingly, many questions may not apply to your facilities. Please complete only those sections that are applicable to your operations.
- If there is more than one plant location, please request additional copies or photocopy it for each facility.
- If the space provided is not adequate, feel free to either copy the form, use a separate sheet or request an additional copy.

Your cooperation in filling out this form is greatly appreciated. If you require additional forms or further information, please contact Mark Bornstein ,Telephone No. (413) 785-5327.

APPENDIX D

SUMMARY OF HYDROCARBON EMISSIONS FOR THE 69 COMMUNITIES IN THE PIONEER VALLEY

HYDROCARBON EMISSIONS, 1974

FOR
AGAWAM

Population, 1970:	21,717	Service Stations, 1972:	22
Area, sq. miles:	23.35	Drycleaners, 1974:	10
Car Registrations, 1971:	18,197	Manuf. Employees, 1973:	1872

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	117	117
Aircraft, LTO's	NA	NA	1	1
Drycleaning	0	0	49	49
Degreasing	0	0	3	3
Surface coatings	1	32	121	153
Chemical manuf.	0	0	4	4
Fuel comb.	0	0	8	8
Solid waste inc.	0	0	2	2
Railroad and vessels	NA	NA	7	7
Totals	1	32	312	344

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

AGAWAM

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
146							32		

HYDROCARBON EMISSIONS, 1974

FOR

AMHERST

Population, 1970: 26,331

Service Stations, 1972: 9

Area, sq. miles: 27.70

Drycleaners, 1974: 4

Car Registrations, 1971: 13,804

Manuf. Employees, 1973: 161

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	48	48
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	22	22
Degreasing	0	0	0	0
Surface coatings	0	0	108	108
Chemical manuf.	0	0	0	0
Fuel comb.	1	3	11	14
Solid waste inc.	0	0	3	3
Railroad and vessels	NA	NA	1	1
Totals	1	3	193	196

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

AMHERST

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
04									3

HYDROCARBON EMISSIONS, 1974

FOR

ASHFIELD

Population, 1970:	1274	Service Stations, 1972:	1
Area, sq. miles:	40.28	Drycleaners, 1974:	0
Car Registrations, 1971:	1194	Manuf. Employees, 1973:	0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	5	5
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	12	12

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

BELCHERTOWN

Population, 1970:	5936	Service Stations, 1972:	5
Area, sq. miles:	52.52	Drycleaners, 1974:	0
Car Registrations, 1971:	4195	Manuf. Employees, 1973:	12

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	27	27
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	24	24
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	22	22
Totals	0	0	76	76

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

BERNARDSTON

Population, 1970: 1659

Area, sq. miles: 23.46

Car Registrations, 1971: 1519

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 6

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	7	7
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	13	13

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

BLANDFORD

Population, 1970:	863	Service Stations, 1972:	1
Area, sq. miles:	52.70	Drycleaners, 1974:	0
Car Registrations, 1971:	902	Manuf. Employees, 1973:	0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	3	3
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	9	9

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

BRIMFIELD

Population, 1970: 1,907

Service Stations, 1972: 1

Area, sq. miles: 35.37

Drycleaners, 1974: 0

Car Registrations, 1971: 1,716

Manuf. Employees, 1973: 16

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	8	8
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	14	14

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

BUCKLAND

Population, 1970: 1892

Area, sq. miles: 19.86

Car Registrations, 1971: 1501

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	8	8
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	15	15

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CHARLEMONT

Population, 1970: 897

Area, sq. miles: 26.05

Car Registrations, 1971: 980

Service Stations, 1972: 3

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	16	16
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	4	4
Totals	0	0	24	24

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CHESTER

Population, 1970: 1025

Area, sq. miles: 36.76

Car Registrations, 1971: 994

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 51

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	5	5
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	5	5
Totals	0	0	10	10

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CHESTERFIELD

Population, 1970: 704

Area, sq. miles: 31.01

Car Registrations, 1971: 674

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 10

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	3	3
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	4	4
Totals	0	0	12	12

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CHICOPEE

Population, 1970:	66,676	Service Stations, 1972:	51
Area, sq. miles:	22.91	Drycleaners, 1974:	15
Car Registrations, 1971:	41,594	Manuf. Employees, 1973:	9,485

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	271	271
Aircraft, LTO's	NA	NA	0	0
Drycleaning	1	6	68	74
Degreasing	2	42	18	60
Surface coatings	6	2749	419	3168
Chemical manuf.	2	624	21	645
Fuel comb.	5	26	64	90
Solid waste inc.	0	0	44	44
Railroad and vessels	NA	NA	6	6
Totals	16	3447	911	4358

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

CHICOPEE

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
168		6							
148						91			
171						47			
149			34		25	1			
14									2
16									3
17									7
18									2
19				894			1580		12
185								36	
190					104			488	
200			8						
147					7				

HYDROCARBON EMISSIONS, 1974

FOR

COLRAIN

Population, 1970:	1420	Service Stations, 1972:	3
Area, sq. miles:	43.21	Drycleaners, 1974:	0
Car Registrations, 1971:	1232	Manuf. Employees, 1973:	50

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	16	16
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	7	7
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	25	25

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CONWAY

Population, 1970: 998

Area, sq. miles: 37.81

Car Registrations, 1971: 1004

Service Stations, 1972: 2

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	16	16

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

CUMMINGTON

Population, 1970: 562

Area, sq. miles: 23.01

Car Registrations, 1971: 621

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 5

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	7	7

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

DEERFIELD

Population, 1970:	3,850	Service Stations, 1972:	4
Area, sq. miles:	32.57	Drycleaners, 1974:	0
Car Registrations, 1971:	3445	Manuf. Employees, 1973:	264

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	21	21
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	4	4
Surface coatings	0	0	20	20
Chemical manuf.	0	0	1	1
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	23	23
Totals	0	0	71	71

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

EASTHAMPTON

Population, 1970: 13,012

Service Stations, 1972: 6

Area, sq. miles: 13.29

Drycleaners, 1974: 3

Car Registrations, 1971: 9971

Manuf. Employees, 1973: 2324

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	32	32
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	6	6
Degreasing	4	62	5	67
Surface coatings	3	31	93	124
Chemical manuf.	1	8	5	13
Fuel comb.	1	1	8	9
Solid waste inc.	0	0	8	8
Railroad and vessels	NA	NA	1	1
Totals	9	102	158	260

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

EASTHAMPTON

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	**Chem. mfg.**	**Fuel comb. & inc.**
137			10						
136					18				
134			8						
135								8	
138						2	3		
139			34		8				
140			10						
24									1

HYDROCARBON EMISSIONS, 1974

FOR

East Longmeadow

Population, 1970: 13,029

Service Stations, 1972: 10

Area, sq. miles: 13.03

Drycleaners, 1974: 2

Car Registrations, 1971: 10,769

Manuf. Employees, 1973: 3011

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	53	53
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	11	11
Degreasing	1	17	5	22
Surface coatings	1	16	104	120
Chemical manuf.	0	0	7	7
Fuel comb.	1	1	20	21
Solid waste inc.	0	0	9	9
Railroad and vessels	NA	NA	0	0
Totals	3	34	209	243

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

EAST LONGMEADOW

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
25			17		16				

HYDROCARBON EMISSIONS, 1974

FOR

ERVING

Population, 1970: 1,260

Area, sq. miles: 14.04

Car Registrations, 1971: 1,015

Service Stations, 1972: 2

Drycleaners, 1974: 0

Manuf. Employees, 1973: 200

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	1	44	9	53
Chemical manuf.	0	0	0	0
Fuel comb.	2	4	1	5
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	3	48	22	70

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

ERVING

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
121						44			3
27									1

HYDROCARBON EMISSIONS, 1974

FOR

Gill

Population, 1970: 1100

Area, sq. miles: 13.84

Car Registrations, 1971: 1029

Service Stations, 1972: 2

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	7	7
Totals	0	0	22	22

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

GOSHEN

Population, 1970: 483
Service Stations, 1972: 2
Area, sq. miles: 17.31
Drycleaners, 1974: 0
Car Registrations, 1971: 526
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	2	2
Totals	0	0	15	15

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

GRANBY

Population, 1970: 5473

Area, sq. miles: 28.01

Car Registrations, 1971: 4542

Service Stations, 1972: 5

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	27	27
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	22	22
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	1	1
Totals	0	0	53	53

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

GRANVILLE

Population, 1970: 1008

Service Stations, 1972: 2

Area, sq. miles: 43.20

Drycleaners, 1974: 0

Car Registrations, 1971: 1035

Manuf. Employees, 1973: 90

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	5	5
Totals	0	0	20	20

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

GREENFIELD

Population, 1970: 18,116

Area, sq. miles: 21.47

Car Registrations, 1971: 14,102

Service Stations, 1972: 20

Drycleaners, 1974: 7

Manuf. Employees, 1973: 2,246

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	106	106
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	38	38
Degreasing	2	55	9	64
Surface coatings	0	0	110	110
Chemical manuf.	0	0	5	5
Fuel comb.	1	2	18	20
Solid waste inc.	0	0	3	3
Railroad and vessels	NA	NA	10	10
Totals	3	57	299	356

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

GREENFIELD

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
100									2
179			12						
201			42						

HYDROCARBON EMISSIONS, 1974

FOR

HADLEY

Population, 1970: 3750

Service Stations, 1972: 10

Area, sq. miles: 23.16

Drycleaners, 1974: 0

Car Registrations, 1971: 3644

Manuf. Employees, 1973: 28

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	53	53
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	15	15
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	12	12
Totals	0	0	82	82

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

HAMPDEN

Population, 1970: 4572

Area, sq. miles: 19.66

Car Registrations, 1971: 3823

Service Stations, 1972: 2

Drycleaners, 1974: 1

Manuf. Employees, 1973: 10

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	5	5
Degreasing	0	0	0	0
Surface coatings	0	0	18	18
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	36	36

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

HATFIELD

Population, 1970: 2825

Service Stations, 1972: 2

Area, sq. miles: 16.21

Drycleaners, 1974: 0

Car Registrations, 1971: 2578

Manuf. Employees, 1973: 130

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	1	1
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	1	429	13	442
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	6	6
Totals	1	429	32	461

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

HATFIELD

Plant I. D.	Emissions by source category (tons/year)								
	Bulk storage	Dry cleaning	Degreasing	Surface coatings				Chem. mfg.	Fuel comb. & inc.
				Fabric & rubber coatings	Paints	Inks	Other		
160						371	58		

HYDROCARBON EMISSIONS, 1974

FOR

HAWLEY

Population, 1970:	224	Service Stations, 1972:	0
Area, sq. miles:	30.99	Drycleaners, 1974:	0
Car Registrations, 1971:	232	Manuf. Employees, 1973:	0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	1	1

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

HEATH

Population, 1970:	383	Service Stations, 1972:	0
Area, sq. miles:	24.95	Drycleaners, 1974:	0
Car Registrations, 1971:	301	Manuf. Employees, 1973:	0

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	2	2

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

HOLLAND

Population, 1970: 931

Area, sq. miles: 12.35

Car Registrations, 1971: 1052

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	6	6
Totals	0	0	15	15

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

HOLYOKE

Population, 1970: 50,112

Service Stations, 1972: 34

Area, sq. miles: 21.16

Drycleaners, 1974: 25

Car Registrations, 1971: 29,741

Manuf. Employees, 1973: 9,203

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	181	181
Aircraft, LTO's	NA	NA	0	0
Drycleaning	3	22	93	115
Degreasing	2	50	16	66
Surface coatings	11	986	355	1341
Chemical manuf.	0	0	20	20
Fuel comb.	8	97	57	154
Solid waste inc.	1	11	42	53
Railroad and vessels	NA	NA	15	15
Totals	25	1166	779	1945

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

HOLYOKE

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
167		7							
162		7							
145						132			
130			5						
129					9				
125					6				
127						6			
128						35			
169		8							
34									8
35									2
36									1
38									11

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

HOLYOKE (Continued)

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
191							131		
192							277		
194						51	22		
37									11
195			45			10			

HYDROCARBON EMISSIONS, 1974

FOR

HUNTINGTON

Population, 1970: 1593

Area, sq. miles: 26.24

Car Registrations, 1971: 1447

Service Stations, 1972: 2

Drycleaners, 1974: 0

Manuf. Employees, 1973: 4

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	1	10	6	16
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	3	3
Totals	1	10	21	31

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

HUNTINGTON

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
152						10			

HYDROCARBON EMISSIONS, 1974

FOR

LEVERETT

Population, 1970: 1005
Area, sq. miles: 22.90
Car Registrations, 1971: 937
Service Stations, 1972: 0
Drycleaners, 1974: 0
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	4	4

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

LEYDON

Population, 1970: 376

Area, sq. miles: 18.09

Car Registrations, 1971: 282

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	7	7

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

LONGMEADOW

Population, 1970: 15,630
Service Stations, 1972: 4
Area, sq. miles: 9.03
Drycleaners, 1974: 2
Car Registrations, 1971: 12,922
Manuf. Employees, 1973: 10

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	21	21
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	5	5
Degreasing	0	0	0	0
Surface coatings	0	0	62	62
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	6	6
Solid waste inc.	0	0	2	2
Railroad and vessels	NA	NA	4	4
Totals	0	0	100	100

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

LUDLOW

Population, 1970:	17,580	Service Stations, 1972:	9
Area, sq. miles:	27.14	Drycleaners, 1974:	6
Car Registrations, 1971:	13,016	Manuf. Employees, 1973:	595

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	48	48
Aircraft, LTO's	NA	NA	0	0
Drycleaning	1	5	23	28
Degreasing	1	8	6	14
Surface coatings	0	0	82	82
Chemical manuf.	0	0	1	1
Fuel comb.	1	1	7	8
Solid waste inc.	0	0	2	2
Railroad and vessels	NA	NA	11	11
Totals	3	14	180	194

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR
LUDLOW

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
165		5							
151			8						
47									1

HYDROCARBON EMISSIONS, 1974

FOR

MIDDLEFIELD

Population, 1970: 288

Service Stations, 1972: 0

Area, sq. miles: 24.13

Drycleaners, 1974: 0

Car Registrations, 1971: 300

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	2	2
Railroad and vessels	NA	NA	1	1
Totals			4	4

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

MONROE

Population, 1970: 216

Area, sq. miles: 10.85

Car Registrations, 1971: 129

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	1	8	0	8
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	1	8	2	10

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

MONROE

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
49									8

HYDROCARBON EMISSIONS, 1974

FOR

MONSON

Population, 1970: 7355

Area, sq. miles: 44.84

Car Registrations, 1971: 5090

Service Stations, 1972: 4

Drycleaners, 1974: 1

Manuf. Employees, 1973: 537

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	21	21
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	5	5
Degreasing	0	0	1	1
Surface coatings	0	0	38	38
Chemical manuf.	0	0	1	1
Fuel comb.	2	5	3	8
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	1	1
Totals	2	5	71	76

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

MONSON

Plant I. D.	Emissions by source category (tons/year)								
	Bulk storage	Dry cleaning	Degreasing	Surface coatings				Chem. mfg.	Fuel comb. & inc.
				Fabric & rubber coatings	Paints	Inks	Other		
52									2
65									3

HYDROCARBON EMISSIONS, 1974

FOR

MONTAGUE

Population, 1970: 8451

Area, sq. miles: 31.02

Car Registrations, 1971: 6678

Service Stations, 1972: 4

Drycleaners, 1974: 0

Manuf. Employees, 1973: 336

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	1[a]	1
Gasoline marketing	NA	NA	21	21
Aircraft, LTO's	NA	NA	4	4
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	39	39
Chemical manuf.	0	0	1	1
Fuel comb.	0	0	3	3
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	9	9
Totals	0	0	79	79

NA: Not Applicable

[a] Airport

HYDROCARBON EMISSIONS, 1974

FOR

MONTGOMERY

Population, 1970: 446
Service Stations, 1972: 0

Area, sq. miles: 15.01
Drycleaners, 1974: 0

Car Registrations, 1971: 443
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	2	2

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

NEW SALEM

Population, 1970: 474

Area, sq. miles: 4504

Car Registrations, 1971: 474

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	32	32
Totals	0	0	34	34

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR
NORTHAMPTON

Population, 1970: 29,664

Area, sq. miles: 34.63

Car Registrations, 1971: 19,254

Service Stations, 1972: 23

Drycleaners, 1974: 7

Manuf. Employees, 1973: 2110

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	122	122
Aircraft, LTO's	NA	NA	3	3
Drycleaning	0	0	35	35
Degreasing	2	27	3	30
Surface coatings	2	25	151	176
Chemical manuf.	0	0	5	5
Fuel comb.	4	6	29	35
Solid waste inc.	0	0	5	5
Railroad and vessels	NA	NA	11	11
Totals	8	58	364	422

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

NORTHAMPTON

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
131						12			
132					13				
133			8						
170			19						
54									1
57									1
58									3
59									1

HYDROCARBON EMISSIONS, 1974

FOR

NORTHFIELD

Population, 1970: 2631
Area, sq. miles: 34.18
Car Registrations, 1971: 2354
Service Stations, 1972: 3
Drycleaners, 1974: 0
Manuf. Employees, 1973: 3

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	16	16
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	10	10
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	7	7
Totals	0	0	34	34

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

ORANGE

Population, 1970: 6104

Service Stations, 1972: 8

Area, sq. miles: 35.03

Drycleaners, 1974: 2

Car Registrations, 1971: 4810

Manuf. Employees, 1973: 18

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	42	42
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	11	11
Degreasing	1	1	1	2
Surface coatings	1	4	34	38
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	10	10
Solid waste inc.	0	0	18	18
Railroad and vessels	NA	NA	6	6
Totals	2	5	122	127

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

ORANGE

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
178			1		4				

HYDROCARBON EMISSIONS, 1974

FOR

PALMER

Population, 1970:	11,680	Service Stations, 1972:	15
Area, sq. miles:	31.43	Drycleaners, 1974:	3
Car Registrations, 1971:	9,496	Manuf. Employees, 1973:	1868

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	80	80
Aircraft, LTO's	NA	NA	1	1
Drycleaning	0	0	16	16
Degreasing	0	0	6	6
Surface coatings	1	5	79	84
Chemical manuf.	0	0	4	4
Fuel comb.	1	3	4	7
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	6	6
Totals	2	8	197	205

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN 5 TONS/YEAR 1974 FOR

PALMER

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
62									3
186						5			

HYDROCARBON EMISSIONS, 1974

FOR

PELHAM

Population, 1970: 937
Area, sq. miles: 24.82
Car Registrations, 1971: 871
Service Stations, 1972: 1
Drycleaners, 1974: 0
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	4	4
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	12	12
Totals	0	0	21	21

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR
Plainfield

Population, 1970: 287
Area, sq. miles: 21.29
Car Registrations, 1971: 339
Service Stations, 1972: 0
Drycleaners, 1974: 0
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	0	0
Totals	0	0	1	1

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

ROWE

Population, 1970: 277
Area, sq. miles: 23.78
Car Registrations, 1971: 284
Service Stations, 1972: 0
Drycleaners, 1974: 0
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	5	5
Totals	0	0	6	6

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

RUSSELL

Population, 1970:	1382	Service Stations, 1972:	2
Area, sq. miles:	17.71	Drycleaners, 1974:	0
Car Registrations, 1971:	1426	Manuf. Employees, 1973:	499

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	1	1
Surface coatings	0	0	13	13
Chemical manuf.	0	0	1	1
Fuel comb.	1	4	1	5
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	3	3
Totals	1	4	30	34

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

RUSSELL

	Emissions by source category (tons/year)								
				Surface coatings					
Plant I. D.	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
69									4

HYDROCARBON EMISSIONS, 1974

FOR

SHELBURNE

Population, 1970: 1836

Service Stations, 1972: 1

Area, sq. miles: 23.22

Drycleaners, 1974: 0

Car Registrations, 1971: 1646

Manuf. Employees, 1973: 136

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	10	10
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.				
Railroad and vessels	NA	NA	0	0
Totals	0	0	16	16

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

SHUTESBURY

Population, 1970: 489

Area, sq. miles: 26.68

Car Registrations, 1971: 510

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	6	6
Totals	0	0	8	8

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

SOUTH HADLEY

Population, 1970:	17,033	Service Stations, 1972:	12
Area, sq. miles:	17.76	Drycleaners, 1974:	0
Car Registrations, 1971:	11,767	Manuf. Employees, 1973:	1370

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	64	64
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	6	6
Surface coatings	3	4415	91	4506
Chemical manuf.	0	0	3	3
Fuel comb.	3	4	6	10
Solid waste inc.	0	0	2	2
Railroad and vessels	NA	NA	5	5
Totals	6	4419	177	4596

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

SOUTH HADLEY

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
74						5			1
101						30	1		
72									1
73									2
193							4379		

HYDROCARBON EMISSIONS, 1974

FOR

SOUTHAMPTON

Population, 1970: 3069

Area, sq. miles: 28.58

Car Registrations, 1971: 2699

Service Stations, 1972: 2

Drycleaners, 1974: 0

Manuf. Employees, 1973: 75

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	13	13
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	7	7
Totals	0	0	32	32

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

SOUTHWICK

Population, 1970: 6,330

Service Stations, 1972: 7

Area, sq. miles: 31.15

Drycleaners, 1974: 2

Car Registrations, 1971: 5732

Manuf. Employees, 1973: 142

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	37	37
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	2	2
Degreasing	0	0	0	0
Surface coatings	0	0	31	31
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	2	2
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	7	7
Totals	0	0	80	80

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

SPRINGFIELD

Population, 1970: 163,905

Service Stations, 1972: 130

Area, sq. miles: 31.70

Drycleaners, 1974: 56

Car Registrations, 1971: 101,508

Manuf. Employees, 1973: 18,220

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	3	915	~ 0	915
Gasoline marketing	NA	NA	690	690
Aircraft, LTO's	NA	NA	0	0
Drycleaning	8	57	220	277
Degreasing	4	37	37	74
Surface coatings	12	762	955	1717
Chemical manuf.	2	1071	42	1113
Fuel comb.	14	51	175	226
Solid waste inc.	0	0	110	110
Railroad and vessels	NA	NA	25	25
Totals	43	2893	2254	5147

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

SPRINGFIELD

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
166		7							
144						9			
86						15		386	16
141					2	6			
142						96			
143			8	12	1				
150			8		4				
163		8							
164		10							
76									1
81									1
83									4
85									1

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

SPRINGFIELD (Continued)

Plant I. D.	Emissions by source category (tons/year)							Chem. mfg.	Fuel comb. & inc.
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other		
96									2
87									1
88									1
89									1
90									3
93									2
94									1
95									1
98									16
172						45			
173			5		6				
177		5							
182			16		7				

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

SPRINGFIELD (Continued)

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
183						478			
184						70			
188						11			
196		7							
197		10							
198		5							
199		5							
205								685	

HYDROCARBON EMISSIONS, 1974

FOR

SUNDERLAND

Population, 1970:	2,236	Service Stations, 1972:	5
Area, sq. miles:	14.36	Drycleaners, 1974:	0
Car Registrations, 1971:	1,963	Manuf. Employees, 1973:	18

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	27	27
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	9	9
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	2	2
Totals	0	0	39	39

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

TOLLAND

Population, 1970: 172

Area, sq. miles: 31.93

Car Registrations, 1971: 176

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	1	1
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	13	13
Totals	0	0	14	14

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WALES

Population, 1970: 852
Area, sq. miles: 16.20
Car Registrations, 1971: 838
Service Stations, 1972: 0
Drycleaners, 1974: 0
Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	3	3
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	4	4

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WARE

Population, 1970: 8187
Area, sq. miles: 34.85
Car Registrations, 1971: 6026
Service Stations, 1972: 9
Drycleaners, 1974: 3
Manuf. Employees, 1973: 1789

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	48	48
Aircraft, LTO's	NA	NA	0	0
Drycleaning	1	7	2	9
Degreasing	0	0	2	2
Surface coatings	1	1327	67	1394
Chemical manuf.	0	0	4	4
Fuel comb.	1	3	3	6
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	54	54
Totals	3	1337	181	1518

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

WARE

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
161		7							
103									3
189							1327		

HYDROCARBON EMISSIONS, 1974

FOR

WARWICK

Population, 1970: 492

Area, sq. miles: 37.19

Car Registrations, 1971: 437

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	3	3
Totals	0	0	5	5

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WENDELL

Population, 1970: 405

Area, sq. miles: 31.65

Car Registrations, 1971: 421

Service Stations, 1972: 0

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source Number	Point source Emissions	Area source emissions	Total
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	2	2
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	3	3

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WESTFIELD

Population, 1970: 31,433

Service Stations, 1972: 18

Area, sq. miles: 46.85

Drycleaners, 1974: 8

Car Registrations, 1971: 23,331

Manuf. Employees, 1973: 5279

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	6[a]	6
Gasoline marketing	NA	NA	96	96
Aircraft, LTO's	NA	NA	30	30
Drycleaning	0	0	33	33
Degreasing	4	104	15	119
Surface coatings	2	63	213	276
Chemical manuf.	1	10	12	22
Fuel comb.	7	19	44	63
Solid waste inc.	0	0	29	29
Railroad and vessels	NA	NA	15	15
Totals	14	196	493	689

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

WESTFIELD

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
154			21						
106			2		1		5		
153								10	
155			36						
107									1
110									3
111									2
113									1
114									1
123									4
124									7
174			45		57				

HYDROCARBON EMISSIONS, 1974

FOR

WESTHAMPTON

Population, 1970: 793

Service Stations, 1972: 0

Area, sq. miles: 27.07

Drycleaners, 1974: 0

Car Registrations, 1971: 701

Manuf. Employees, 1973: 25

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	3	3
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	4	4

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR
WEST SPRINGFIELD

Population, 1970: 28,461
Service Stations, 1972: 36
Area, sq. miles: 16.75
Drycleaners, 1974: 16
Car Registrations, 1971: 21,632
Manuf. Employees, 1973: 2576

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	191	191
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	52	52
Degreasing	4	33	14	47
Surface coatings	4	529	154	683
Chemical manuf.	0	0	8	8
Fuel comb.	3	61	45	106
Solid waste inc.	0	0	23	23
Railroad and vessels	NA	NA	21	21
Totals	11	623	508	1131

NA: Not Applicable

HYDROCARBON SOURCES GREATER THAN
5 TONS/YEAR 1974
FOR

WEST SPRINGFIELD

Plant I. D.	Emissions by source category (tons/year)								
				Surface coatings					
	Bulk storage	Dry cleaning	Degreasing	Fabric & rubber coatings	Paints	Inks	Other	Chem. mfg.	Fuel comb. & inc.
156			17						
157						346			
158			6						
159					6				
116									4
117									53
122									4
175					115	38			
176			2		23	1			
187			8						

HYDROCARBON EMISSIONS, 1974

FOR

WHATELY

Population, 1970:	1145	Service Stations, 1972:	0
Area, sq. miles:	20.46	Drycleaners, 1974:	0
Car Registrations, 1971:	1094	Manuf. Employees, 1973:	0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	0	0
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	5	5
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	3	3
Totals	0	0	8	8

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WILBRAHAM

Population, 1970:	11,984	Service Stations, 1972:	6
Area, sq. miles:	22.22	Drycleaners, 1974:	3
Car Registrations, 1971:	10,873	Manuf. Employees, 1973:	997

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	32	32
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	11	11
Degreasing	0	0	1	1
Surface coatings	0	0	67	67
Chemical manuf.	0	0	2	2
Fuel comb.	0	0	4	4
Solid waste inc.	0	0	1	1
Railroad and vessels	NA	NA	2	2
Totals	0	0	120	120

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974
FOR
WILLIAMSBURG

Population, 1970: 2342

Service Stations, 1972: 2

Area, sq. miles: 25.57

Drycleaners, 1974: 4

Car Registrations, 1971: 2029

Manuf. Employees, 1973: 38

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	11	11
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	18	18
Degreasing	00	0	0	0
Surface coatings	0	0	9	9
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	1	1
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	40	40

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

WORTHINGTON

Population, 1970: 712

Area, sq. miles: 32.04

Car Registrations, 1971: 710

Service Stations, 1972: 1

Drycleaners, 1974: 0

Manuf. Employees, 1973: 0

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	0	0	~ 0	0
Gasoline marketing	NA	NA	5	5
Aircraft, LTO's	NA	NA	0	0
Drycleaning	0	0	0	0
Degreasing	0	0	0	0
Surface coatings	0	0	3	3
Chemical manuf.	0	0	0	0
Fuel comb.	0	0	0	0
Solid waste inc.	0	0	0	0
Railroad and vessels	NA	NA	1	1
Totals	0	0	9	9

NA: Not Applicable

HYDROCARBON EMISSIONS, 1974

FOR

PIONEER VALLEY

Population, 1970: 642,241

Service Stations, 1972: 507

Area, sq. miles: 1,854.63

Drycleaners, 1974: 180

Car Registrations, 1971: 452,587

Manuf. Employees, 1973: 65,819

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	3	915	7[a]	922
Gasoline marketing	NA	NA	2,692	2,692
Aircraft, LTO's	NA	NA	52	52
Drycleaning	14	97	727	824
Degreasing	27	435	153	588
Surface coatings	51	11,427	3,676	15,103
Chemical manuf.	6	1,713	147	1,860
Fuel comb.	57	299	552	851
Solid waste inc.	1	11	310	321
Railroad and vessels	NA	NA	422	422
Totals	159[b]	14,897	8,738	23,635

NA: Not Applicable

[a] Two airports

[b] An establishment may be performing operations in more than one source category. Actually 144 establishments are sources.

HYDROCARBON EMISSIONS, 1974

FOR

SPRINGFIELD STUDY AREA

Population, 1970: 563,323

Service Stations, 1972: 428

Area, sq. miles: 655.72

Drycleaners, 1974: 168

Car Registrations, 1971: 382,908

Manuf. Employees, 1973: 60,081

Hydrocarbon emissions - tons/year

Source category	Point source		Area source emissions	Total
	Number	Emissions		
Bulk petro. prod. storage	3	915	6[a]	921
Gasoline marketing	NA	NA	2,273	2,273
Aircraft, LTO's	NA	NA	48	48
Drycleaning	13	90	674	764
Degreasing	24	380	136	516
Surface coatings	47	10,042	3,240	13,282
Chemical manuf.	6	1,713	135	1,848
Fuel comb.	51	278	504	782
Solid waste inc.	1	11	287	298
Railroad and vessels	NA	NA	188	188
Totals	145[b]	13,429	7,491	20,920

NA: Not Applicable

[a] Airport

[b] An establishment may be performing operations in more than one source category. Actually 132 establishments are sources in the Springfield Study Area.